The role of coping in primary care low back pain patients

Natalie Zadurian

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Keele University

Arthritis Research UK Primary Care Centre

Abstract

Low back pain affects a large proportion of the general population. For some individuals, back pain becomes chronic, complex and difficult to treat effectively, with patients reporting continued pain and disability. A biopsychosocial framework has been adopted within research and clinical practice, as psychosocial factors have been recognised to be important in terms of pain management and recovery from back pain. Coping-related factors have been identified as particularly important, however a comprehensive examination of a wide range of coping factors is missing from available literature.

A systematic review of the published literature identified important psychological factors that are predictive of low back pain outcome. Several factors emerged as potentially important, but fear avoidance beliefs appeared to be the most consistent predictor. Very few studies were found that investigated the role of behavioural coping, therefore a new measurement instrument was developed to aid further research.

A detailed analysis of the Coping Strategies Questionnaire-24 was undertaken. Exploratory and confirmatory factor analyses were used and it was concluded that the measure was appropriate for use within this thesis.

Data from a large cohort of primary care low back pain patients (n = 1,591) was used for analysis. Cross-sectional analyses revealed potential confounders of the relationship between coping and outcome at 12 months follow-up, which were controlled for within the longitudinal analyses. Only five coping variables were independently predictive of outcome – anxiety, depression, catastrophizing, self-

efficacy and passive behavioural coping – along with pain duration and employment status.

Change in coping over time predicted low back pain outcome, and it was found that coping worsening was particularly important. Coping worsening also partially mediated the relationship between pain duration and outcome.

The major thesis findings were integrated into an overall conceptual model of coping, and key implications of this for clinical practice and research were discussed.

Table of contents

List of tables

List of figures

List of boxes

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1. Thesis introduction: Low back pain in primary care and the construct of coping

1.1. Low back pain: An overview

Low back pain and musculoskeletal disorders are major problems within the community. Palmer et al (2000) provided a one year prevalence rate of 49.1% for symptoms of low back pain, and Carew et al (2010) stated that: “Musculoskeletal disorders affect more than one million people and cost 7.4 billion pounds a year, accounting for up to a third of all GP consultations and 9.5 million lost working days” (pg. 28-29). The economic costs are therefore high. In particular, the costs associated with low back pain are substantial, with Maniadakis and Gray (2000) estimating the direct health care cost of back pain in the UK in 1998 to be 1632 million pounds. However, they stated that this cost is insignificant compared to the indirect costs related to it (e.g. informal care and production losses), which total 10668 million pounds. Therefore it was one of the most costly conditions for which an economic analysis had been carried out in the UK (Maniadakis and Gray, 2000), however there have been no recent economic analyses to confirm that this is still the case. Primary care is usually the setting in which low back pain is first presented when patients seek professional help. The initial GP consultation provides an opportunity to assess patients and influence their management of the condition at an early stage and it is therefore particularly important for researchers and clinicians to work together to provide the best possible patient care and to manage low back pain within the context of primary care (i.e. without the need for future referrals to specialist services). If this can be done more effectively, the

huge economic burden of low back pain on the healthcare system could potentially be reduced. For example, there are an estimated 4.6 million primary care consultations for back pain per year in the UK (Belsey, 2002), Maniadakis and Gray (2000) reported that the cost of back pain is equivalent to over one-fifth of the UK's total health expenditure and Waddell (2004) stated that in terms of health conditions, it represents three times the total cost of all types of cancer. This finding was supported by Young (2003) who stated that: "Back pain is one of the most prevalent, costly, disabling, and poorly understood health problems to afflict Western society". Back pain is one of the most common reasons for healthcare use, and non-specific low back pain poses problems for health care professionals, who are unable to diagnose any specific disease or prescribe an effective cure (Waddell, 2004). This in turn poses problems for patients, because they want to know what is wrong with them but they cannot get clear advice on the cause of the problem, how to deal with it, and its likely outcome (Waddell, 2004). The consequences of back pain for the individual can be devastating, as sufferers often have to deal with work loss, financial consequences, and psychological problems in addition to pain and disability. Studies have reported associations between chronic low back pain and sleep disturbances, reduced quality of life, and higher than average levels of anxiety and depression (Baliki et al, 2008; Mok and Lee, 2008; Waxman et al, 2008).

Low back pain is generally defined as pain between the lowest ribs and the inferior gluteal folds, lasting for more than 24 hours (Croft et al, 1999). It may be related to mechanical strain or dysfunction, although it often develops spontaneously (Waddell, 2004). Low back pain can be caused by specific serious spinal pathology (specific disease) such as malignancy, fracture, infection, or

inflammatory disease, however these cases are very rare in primary care populations. For example, malignancy is the most common specific serious spinal pathology but is estimated to occur in less than 1% of primary care low back pain patients (Henschke et al, 2007). Some patients have specific types of low back pain, such as nerve root compression (e.g. sciatica) and spinal stenosis, however these diagnoses are rare and the vast majority (approximately 90% to 95%) of primary care patients are diagnosed with non-specific low back pain (Kjaer et al, 2005; Lie, 1990; van Tulder et al, 2002), with no identifiable cause or specific medical problems other than the pain itself. Dunn and Croft (2004) stated that non-specific low back pain is known to run an episodic, variable, or fluctuating course, punctuated by recurrence and recovery. They also added that some patients recover, some experience repeated episodes and others experience continuous symptoms for years. Low back pain has been traditionally classified as either acute (less than three months duration, usually thought of as related to, and in proportion with, tissue damage) or chronic (more than three months duration and not in-line with normal healing processes) (Merskey and Bogduk, 1994). This classification is in-line with clinical guidelines (Airaksinen et al, 2006; van Tulder et al, 2006), and reflects the widely used International Association for the Study of Pain (IASP) definition of chronic pain: ‘Pain without apparent biological value that has persisted beyond normal tissue healing time (usually taken to be three months)’ (IASP: Pain Clinical Updates, 2003). Subsequently, many prospective studies focusing on the development of chronic low back pain choose to assess patients at three months follow-up (Dionne et al, 2007; Jones et al, 2006; Sieben et al, 2005). Chronic low back pain is complex, often becoming dissociated from the original physical problem, intractable to treatment, and self-sustaining

(Waddell, 2004). This creates considerable problems for health care professionals in their attempts to provide effective interventions to manage the condition. However the general clinical course of non-specific low back pain is favourable, with most patients suffering from an episode of acute pain. For example, most pain will have resolved within two weeks and about 90% of patients will have stopped consulting for their back pain within three months (Croft et al, 1998; van Tulder et al, 2002). Carey et al (2000) also found that only 7.7% of their sample of acute low back pain patients went on to develop a chronic pain problem. So many low back pain patients who consult within primary care will proceed to good clinical outcomes. But for the small percentage whose pain problems do not resolve quickly, poor outcomes such as persistent pain and disability are likely (Carey et al, 2000). It is important to identify why certain patients proceed to poor outcomes when the majority of acute low back pain patients proceed to recovery or improvement, and there has been considerable focus within epidemiological research in recent years on the prediction of low back pain outcome in an attempt to reveal why chronic pain develops in some patients but not in others.

1.2. The relationship between pain and disability

The disability displayed by patients with low back pain is linked to the pain itself, but the relationship between pain and disability is not straightforward. It might be expected that the higher the level of pain intensity that a patient experiences, the higher the level of disability they will demonstrate given that pain impacts on the performance of daily tasks (Rodriguez-Blanco et al, 2010). Therefore increasing levels of pain might be assumed to lead to increasing levels of

limitation/incapacity, perhaps in a linear fashion. However, different patients with similar back problems or presentations can experience very different amounts of pain and disability. Back pain does not always lead to disability, and the amount of disability is not always proportionate to the severity of the pain (Waddell, 2004). Therefore for some individuals, there is no linear relationship between pain and disability, suggesting that there cannot be a purely biomedical explanation for low back pain. A purely biomedical explanation suggests that disease processes can be explained in terms of underlying deviations from normal function, such as pathogens, genetic/developmental abnormalities, or injuries (Engel, 1977). A solely biomedical explanation for low back pain would mean that the disability displayed by low back pain patients should be proportionate to the level of pain experienced, and since this is clearly not the case, there must be other factors involved.

Engel (1977) proposed the biopsychosocial model, which takes into account psychological and social factors as well as biological ones, and recognizes that all three play a significant role in disease/illness-related functioning. It is now widely accepted that low back pain and disability are best understood and managed within a biopsychosocial model (Okifuji and Palmer, 2004; Waddell, 2004). Pain is complex and subjective, with cognitions, emotions, and behaviours all contributing to and influencing the course of the personal pain experience, and psychosocial factors have been highlighted as influential in this experience by previous research. Waddell (2004) stated that low back disability, and how people react to pain and to treatment, depends just as much on psychological and social factors as the underlying physical problem, and Patel (2007) suggested that psychosocial factors might play a more pronounced role than medical factors in the

development of chronic back pain. This supports the findings of Carragee et al (2005) who reported that the development of low back pain disability was strongly predicted by baseline psychosocial variables and that magnetic resonance imaging (MRI) and discography testing at baseline had no association with disability. O'Sullivan (2005) stated that a multi-dimensional approach to dealing with chronic low back pain based on a biopsychosocial model is required and Evans et al (2005) found that, consistent with this model, psychosocial variables accounted for approximately half of the variance in chronic pain patients' physical functioning scores. Therefore, the application of a biopsychosocial model of pain is advantageous and should be encouraged in order to address influential psychological and social predictors of low back pain outcome in addition to biomedical predictors. Further support for the consideration of these factors comes from Vlaeyen et al (1995) who found that psychological factors were predictive of chronic low back pain disability where pain intensity and biomedical findings were not. Linton et al (2000) also showed that psychological factors are important, even for moderate pain problems and stated that "this implicates these factors in the development of pain-related disability long before the problem is recognized by health care and insurance authorities" (pg. 301).

Of the range of different psychological factors suggested as predictive of low back pain outcome, the way patients cope with their pain and the coping strategies they use to do this have been identified as important predictors of future pain and disability (Jones et al, 2006; Keefe et al, 2004). This thesis provides a detailed examination of coping through exploration of the concept of coping, systematic review of previous research examining psychological predictors of low back pain outcome, analysis of the different ways of measuring coping, investigation of the

role of coping in the prediction of low back pain outcome in primary care, and development of a coping model that may increase understanding in this area and facilitate more effective pain management.

1.3. What is coping?

The dictionary definition of the verb ‘cope’ is: “to struggle or deal successfully with, to manage” (Chambers Super-Mini Dictionary, 2000). It has also been defined as: “to struggle or deal, on fairly even terms or with some degree of success” (Dictionary.com). Both definitions imply that coping is either a struggle (difficult/unsuccessful) or that it is successful, but they do not reveal anything about why an individual would need to cope in the first place. In order to make these definitions of coping more concrete, it must be highlighted that the individual is coping with something (i.e. a situation or an emotion, or in this case, low back pain) in an attempt to achieve a desired outcome (such as improvements in pain and functioning or ability to get on with normal life, despite the pain). A more specific, psychological definition of coping has been proposed by the transactional model of stress (Lazarus and Folkman, 1984): “constantly changing cognitive and behavioural efforts to manage specific external and/or internal demands that are appraised as taxing, or exceeding the resources of the person”. This definition highlights the dynamic nature of coping, indicating that coping strategies are continually appraised, adjusted, and reappraised by the individual. This was echoed by DeGood and Tait (2001) who stated that: “Coping is a fluid process, subject to change across situations and over time…a process composed of appraisals, responses, and reappraisals” (pg. 327). So it has been agreed that

coping is changeable over time, however few studies have even attempted to clearly define pain coping beyond this. Thus the definition of pain coping is ambiguous.

Given the lack of clear and consistent definitions of pain coping, studies in the field have examined coping from a variety of angles, making collation of research findings difficult. These problems have been recognised by researchers in the back pain field, who have highlighted the problems of conceptual and measurement overlap and the need to develop clearer definitions of psychological concepts in order to improve understanding (Keefe et al, 2004; Main et al, 2008; Waddell, 2004). A more standard definition of pain coping is therefore needed and will be presented here in an attempt to bring together previous research findings and provide a theoretical framework underlying the analyses to be conducted within this thesis. It is hoped that this definition will help to standardise the dimensions and terminology used within the coping literature.

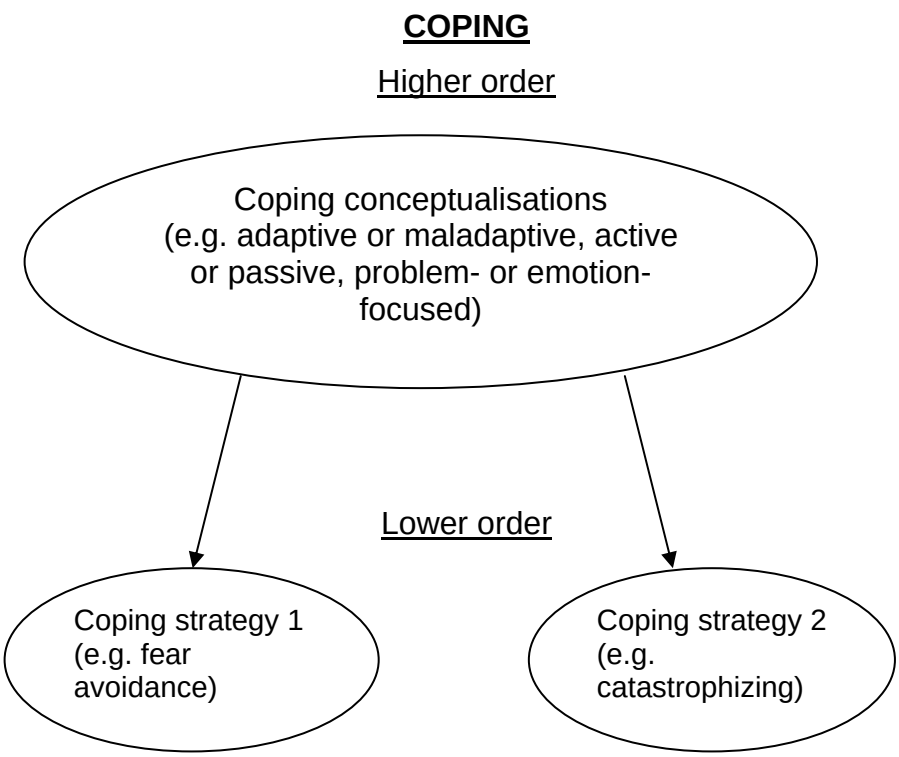
Many research studies have been conducted, but terminology is used arbitrarily. For example, the terms ‘coping’ and ‘coping strategies’ are often used interchangeably, with no real consideration of the differences between them. There is a distinction between these two terms, and it is important to clarify that distinction before attempting to analyse any coping data. Skinner et al (2003) stated that ‘coping’ is: “an organizational construct used to encompass the myriad actions individuals use to deal with stressful experiences” (pg.217). This highlights the fact that coping is an overall term, referring to the effect of the sum of a number of methods. Therefore, coping may best be viewed as a construct that is not directly observable (i.e. a latent variable), but rather inferred from measurable

indicators (e.g. coping strategies, attitudes, beliefs). ‘Coping strategies’ are therefore measurable indicators of ‘coping’.

1.4. Pain coping strategies

In their attempts to define pain coping, Skinner et al (2003) identified lower and higher order categories (see figure 1.1). Lower order categories are often labelled as ‘ways of coping’ or ‘coping strategies’, and relate to the individual, measurable strategies that patients use (e.g. catastrophizing, medication taking). They are: “the basic categories used to classify how people cope. They capture the ways people actually respond to stress” (Skinner et al, 2003, pg. 216). Higher order categories are used to classify these coping strategies into groups (i.e. they relate to conceptualisations of coping strategies).

Figure 1.1: Lower and higher order categories (adapted from Skinner et al, 2003)



Coping strategies have previously been conceptualised in several different ways. For example, pain coping strategies can be thought of as adaptive or maladaptive (Rosenstiel and Keefe, 1983). This relates directly to the dictionary definitions provided previously, which state that coping is either successful (adaptive) or unsuccessful (maladaptive). Adaptive coping can help patients to manage their pain and reduce disability, whereas maladaptive coping can lead to chronic pain and disability, as well as negative psychological and social consequences (Tan and Jensen, 2008). However, it can be problematic to think of specific coping strategies as inherently adaptive or maladaptive because they may be useful at one point in time but of little value at another (Turner, 1991). An example of this is the coping strategy of acceptance (e.g. a patient accepting that the pain is present and that they must learn to live with it whilst not focusing on finding a 'cure' for the pain). Keefe et al (2004) stated that: 'Acceptance is not appropriate when pain is controllable, but rather it is useful in situations in which pain cannot be easily controlled and in which repeated struggles to free oneself from pain interfere with the process of adjustment' (pg.202). So when patients' pain is not easily controlled, acceptance may be viewed as adaptive. But when patients' pain is easily controllable, acceptance is seen as maladaptive. This example shows that the effectiveness of coping strategies and interpreting them as either helpful or unhelpful is largely context-dependent.

Pain coping strategies can also be conceptualised as active or passive (Brown and Nicassio, 1987). Brown and Nicassio (1987) describe active coping in relation to internal control, where the individual takes responsibility for pain management and makes attempts to control the pain or to function in spite of it. The same authors describe passive coping in relation to external control, where the individual

gives responsibility for pain management to an outside source, or allows other areas of their life to be adversely affected by the pain. There is a substantial amount of evidence highlighting the detrimental effects of passive coping in low back pain within both primary care and general populations, with significant relationships found between the use of passive coping strategies and increased risk of persistent disabling low back pain (Jones et al, 2006; Mercado et al, 2005). For example, Jones et al (2006) found that patients who reported high levels of passive coping experienced a threefold increase in the risk of persistent disabling low back pain at follow-up. However evidence regarding the effects of active coping has been far less conclusive. Potter et al (2000) reported that low levels of active coping were associated with pain maintenance and poor prognosis, but Jones et al (2006) found that active coping had no effect on prognosis at all, showing that a high active coping score was associated with neither an increase nor a decrease in the risk of persistent disabling low back pain.

Several other conceptualisations of coping have also been proposed by researchers in the field such as problem- and emotion-focused coping (e.g. problem-focused coping relates to the efforts made to alter or manage the source of the problem, for example ‘made a plan of action and followed it’. Emotion-focused coping relates to the efforts made to reduce or manage the emotional distress caused by the problem, for example ‘looked for the “silver lining”/tried to look on the bright side of things’ – Folkman and Lazarus, 1980), but they all seem to suffer from similar problems due to their mutually exclusive nature and subsequent need to categorise coping strategies as either one or the other. The problem is that these conceptualisations do not take into account the fact that patients often use combinations of strategies, and the strategies they use can

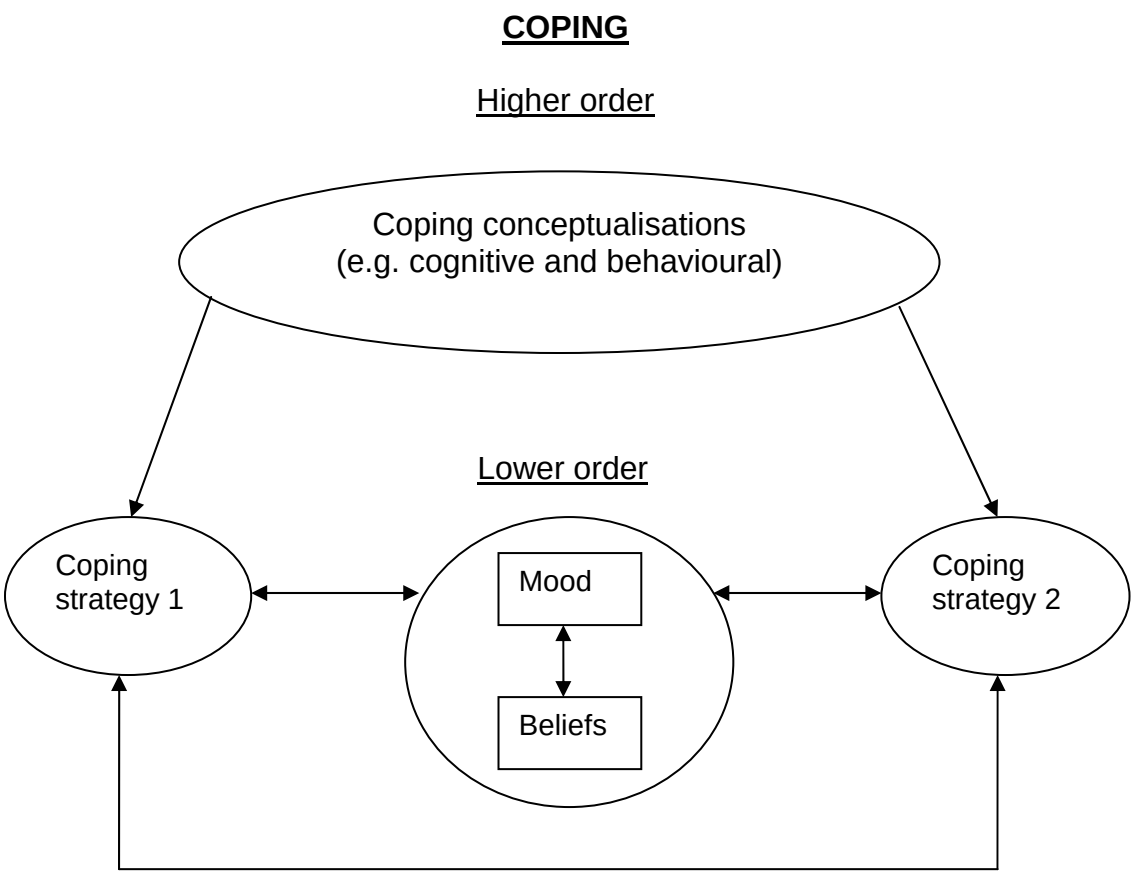
change over time. Therefore, it is necessary to establish a conceptualisation of coping that will address these problems, by acknowledging patients' use of a number of different types of coping strategy. This thesis proposes a different conceptualisation, suggesting the division of coping into cognitive and behavioural (i.e. the actual behaviours that patients use to cope with pain, such as lying down and exercising) domains recognising that people can simultaneously use both cognitive and behavioural coping strategies (i.e. people are not classed as being either cognitive or behavioural copers but rather, they could be in both of these categories – to similar or different extents – at the same time).

1.5. Definition of coping

Figure 1.2 provides a visual explanation of the definition of coping that will be used as a basis for the analyses conducted within this thesis. This definition utilises Skinner et al's (2003) lower and higher order categories to clarify the position of the coping conceptualisation, whilst also identifying how 'coping strategies' (along with other important coping-related variables) fit into the definition of 'coping' as an overall concept. Figure 1.2 clearly shows coping to be a concept consisting of higher order categories (i.e. the conceptualisation of coping) and lower order categories (i.e. the individual coping strategies used by patients). However, it also depicts 'mood' and 'beliefs' as belonging to the lower order categories. Mood factors can often occur as responses to stress (Firk and Markus, 2009). These stress responses are connected to coping responses, with potential interactions likely (Martyn-Nemeth et al, 2009). For example, anxiety and depression can influence the beliefs patients hold about their pain condition, the amount of effort

they put into recommended treatment (e.g. exercise), and also the coping strategies they choose to utilise (Hasenbring, 2000; Weickgenant et al, 1993). All of these influences can greatly affect pain coping and outcome, therefore mood factors form an important part of the overall concept of coping.

Figure 1.2: Diagram of 'coping' as an overall concept



According to Pearlin and Schooler (1978), coping functions at a number of levels and is influenced by a plethora of behaviours, cognitions, and perceptions. This suggests that perceptions/beliefs are also an important aspect of coping, seemingly as important as behaviours and cognitions. The coping strategies used by low back pain patients, as well as the subsequent appraisals and adjustments of these strategies, are thought to be influenced by patients' pain beliefs, which

can impact on functioning and adjustment (Jensen et al, 1991). DeGood and Tait (2001) stated that beliefs compatible with treatment must exist if patients are to cope effectively with pain, and maladaptive cognitions can lie at the heart of the chronic pain problem. In addition, pain beliefs are hypothesized to have a direct influence on mood, which can also impact on functioning (Jensen et al, 1991). Due to the predictive power that mood and pain beliefs have over coping, pain, and disability, it is important to include them within definitions of 'coping' as an overall concept, to facilitate research into pain management and factors associated with the coping strategies that patients use.

In order to provide practically useful findings, pain coping researchers should examine a wide range of coping-related factors within their research studies. However, many studies are limited by their focus on a very small number of factors (Foster et al, 2010). This creates problems as studies tend to investigate only a few of the more commonly studied coping-related factors (i.e. those which have generated the most interest within the field in recent years), and neglect those which are less popular. Section 1.6 considers the different coping-related factors suggested as potentially important in the field of low back pain and the evidence for them from recent research studies.

1.6. Coping-related factors

Catastrophizing

Catastrophizing has been described as: "an attentional bias toward negative aspects and exaggeration of the situation" (Vlaeyen et al, 1995, pg.237). Sullivan

et al (2001) stated that catastrophizing is a coping response designed to deal with negative emotions by eliciting proximity to and support from others. Researchers have suggested that it is an important predictor of adjustment, associated with increased pain, psychological distress, and physical disability, and that it is a powerful predictor of chronicity at one year (Burton et al, 1995; Geisser et al, 1999; Keefe et al, 2004). There has been some debate as to whether catastrophizing should be considered as a coping strategy, or as a psychological distress factor or appraisal (Jensen et al, 1991 in DeGood and Tait, 2001; McCracken and Gross, 1993). It has also been suggested that catastrophizing might be included in the coping strategy 'helplessness-hopelessness', which is used to describe patients who are fully submerged by negative emotions (Koleck et al, 2006). Therefore, further research that helps identify the specific role of catastrophizing would be useful. However, regardless of its definition, catastrophizing has been recognised as an important factor relating to adjustment and chronicity in low back pain, and this has been reflected by the number of researchers choosing to focus on catastrophizing as the primary concept within their pain coping research.

Kinesiophobia/fear-avoidance beliefs

Kinesiophobia is an excessive, irrational (not predicted by pain intensity), and debilitating fear of physical movement and activity, resulting from a feeling of vulnerability to painful injury or reinjury (Kori et al, 1990). This fear can result in patients avoiding certain activities due to an anticipation (fear avoidance belief) that these activities will lead to an increase in pain. This avoidance behaviour can have detrimental consequences (both physically and psychologically) and is

thought to be one of the mechanisms involved in sustaining chronic pain disability (Vlaeyen et al, 1995). Indeed, kinesiophobia has been shown to be a powerful predictor of chronicity for primary care low back pain patients (Klenerman et al, 1995). Lethem et al (1983) proposed the fear-avoidance model, which highlights the associations between kinesiophobia, avoidance behaviour, and chronicity. The model identifies fear of pain as the central concept, which elicits one of two responses, either confrontation or avoidance. Confrontation refers to the individual boldly facing the pain, staying active, and recognising and confronting their fears and beliefs about movement and (re)injury. Avoidance refers to a restriction in daily activities due to patients avoiding specific activities they believe might produce or increase pain. In this model, confrontation is thought to lead to the reduction of fear over time and ultimately to recovery, whilst avoidance leads to the maintenance of fear and the reduction of social and physical activities, or avoidance behaviour (Vlaeyen et al, 1995). This avoidance behaviour results in detrimental physical and psychological consequences, including depression, disability, and the vicious cycle of disuse in which physical deconditioning results in increased pain, making avoidance more likely (Bortz, 1984). Preliminary studies have identified links between catastrophizing, kinesiophobia, distress and disability, although findings in this area are sparse (Hasenbring, 2000; Sullivan and D'Eon, 1990; Vlaeyen et al, 1995). These preliminary findings highlight the importance of conducting future research to further investigate the interrelationships between coping strategies in order to better understand their role and relative importance in the prediction of chronicity in low back pain.

Self-efficacy

One coping-related belief factor that appears to be particularly important is self-efficacy. In this context, self-efficacy can be defined as “a person’s confidence in their ability to engage in a course of action sufficient to accomplish a desired outcome, such as control of their pain” (Keefe et al, 2004, pg.198-9). Self-efficacy for coping has been shown to be extremely influential in determining how effective patients are with their pain management, with higher levels of self-efficacy relating to lower levels of pain and psychological distress, and more positive medical outcomes (Keefe et al, 2004). Individuals with high self-efficacy are more confident in their ability to control their pain, therefore making them more likely to try harder and persevere with coping, and ultimately more likely to live up to their own expectations (Waddell, 2004). Evidence in support of this comes from Estlander et al (1994) who found that back pain patients’ self-efficacy for their ability to endure physical activity was a better predictor of performance than levels of pain and disability.

Anxiety and depression

Anxiety and depression are factors that have traditionally been grouped together to indicate psychological distress. Anxiety can be regarded as a state of uneasiness and apprehension about future uncertainties (Dictionary.com), whereas depression is a state of great unhappiness, pessimistic thinking, and despondency (Oxford English Mini Dictionary, 2007; wordnet.Princeton.edu). In relation to low back pain coping and outcome, pain-related anxiety has been

reported to lead to poor adjustment (Keefe et al, 2004), with depression being identified as the only significant predictor of emotional non-adjustment (Koleck et al, 2006). Vlaeyen et al (1995) also stated that depression is associated with decreasing pain tolerance levels, and hence the promotion of the painful experience. Anxiety and depression are also related to the concept 'helplessness-hopelessness' (Koleck et al, 2006). Koleck et al (2006) found that patients who displayed 'helplessness-hopelessness' did not believe in cure and recovery, and that use of this strategy directly predicted low emotional adjustment and had a negative influence on outcome. Psychological distress (e.g. anxiety and depression) has also been utilised as an outcome within the pain coping literature (Keefe et al, 2004), although its predictive role in low back pain outcome is widely recognised (Cherkin et al, 1996; Keeley et al, 2008; Pincus et al, 2002).

Another coping factor that appears to relate closely to anxiety and depression is 'negative affect'. Stegen et al (1998) stated that negative affect reflects a general tendency to experience subjective distress and dissatisfaction. They also stated that the concept subsumes a variety of negative mood states (anxiety, depression, and hostility) and characteristics such as introspectiveness, dwellings on failures and shortcomings, and a negative self-view. The impact of negative affect on low back pain outcome appears to be detrimental in much the same way as that of anxiety and depression, in that it predicts failure to recover and the development of long-term low back pain (Gheldof et al, 2007).

This chapter has provided an introduction to the area of coping with low back pain, highlighting the importance of psychological factors in the prediction of low back pain outcomes and the problems inherent in the definition and measurement of

pain coping as a concept. Section 1.7 describes the prospective cohort of low back pain patients that was utilised for analyses within this thesis, and section 1.8 identifies the overall aims that this thesis will attempt to address.

1.7. Beliefs about Back Pain Study

In order to address the identified aims of this thesis, a large existing prospective cohort of low back pain consulters in primary care was used. The existing dataset was part of a large Arthritis Research UK and North Staffordshire Primary Care Research Consortium funded programme called the Beliefs about Back Pain Study, the BeBack study. This was a large prospective cohort study of consecutive patients consulting with low back pain in eight general practices in North Staffordshire and Central Cheshire, and included patients aged 18 to 60 years who consulted their general practitioner with low back pain from September 2004 to April 2006 (n = 1,591). These patients completed a questionnaire at baseline (within several weeks of their GP consultation) and were asked to complete subsequent postal questionnaires at 3, 6, and 12 months follow-up (see Appendix 1, pg. 357 and pg. 385 for the baseline and 12 month questionnaires). This questionnaire assessed demographic variables, such as age, gender, employment status, job title, job satisfaction, sick leave, and reasons for unemployment. The questionnaire also assessed the clinical variables pain intensity, duration and disability, along with several coping-related variables. Examples of these coping-related variables include fear avoidance beliefs, coping strategies (catastrophizing, diversion, reinterpretation and cognitive coping), pain self-efficacy, anxiety and depression. All the statistical analyses presented within this thesis were conducted

using the BeBack dataset. Previous publications provide full details of the design and methods of the BeBack study (Grotle et al, 2010; Foster et al, 2008).

1.8. Aims of the thesis

To address the current gaps in the literature relating to coping with low back pain in primary care, there are five overall aims of this thesis. The first aim is to review the published literature and provide an overall examination of the amalgamated findings. The second aim is to provide a methodological overview and detail the development of a new measure of behavioural coping. The third aim is to explore the baseline cross-sectional data, whilst the fourth aim is to explore the follow-up data (12 months). Finally, the fifth aim is to provide a coping model and summary of the thesis findings and implications.

1.8.1. First aim: To systematically review the published literature in order to identify important psychological factors that are predictive of low back pain outcome.

This aim is addressed by answering the following research questions (see Chapter 2):

a) What are the criteria for considering studies for this review in terms of:

- Types of studies?
- Types of participants?
- Types of outcome measurement?

b) What specific search strategy will be used in order to identify all relevant published studies?

c) How will the identified studies be assessed in terms of quality?

d) Which data should be extracted from the identified studies?

e) How should the results of the identified studies be presented in order to provide an overall examination of the amalgamated findings?

1.8.2. Second aim: To provide a detailed overview of the measurement of cognitive and behavioural coping strategies, and to develop a new measure of behavioural coping for use in this thesis.

This aim is addressed by answering the following research questions (see Chapters 4 and 5):

a) What is factor analysis, what are the requirements for its use, and how should the results of factor analyses be interpreted?

b) Is the BeBack data suitable for factor analysis?

c) Which of the BeBack questionnaire items relating to behavioural coping load onto which behavioural coping factors, and how will these factors be conceptualised/interpreted?

d) Are the behavioural coping factors internally consistent, and which questionnaire items should be included/excluded to provide optimal internal consistency?

e) What standardised instruments are available to measure cognitive coping, and how do these measures differ?

f) How was the Coping Strategies Questionnaire-24 (the coping measure used in BeBack) developed, and is it a robust measure?

g) Is the Coping Strategies Questionnaire-24 suitable for use in the analysis of coping in the remaining thesis chapters?

1.8.3. Third aim: To describe epidemiological patterns of coping (cognitive and behavioural) among patients consulting with low back pain in primary care, and to investigate whether they differ according to other patient characteristics.

This aim is addressed by answering the following research questions (see Chapters 3 and 6):

a) What are the baseline characteristics of the BeBack sample, and is this sample similar to other primary care low back pain cohorts?

b) Are there any associations between coping and socio-demographic or clinical factors (at baseline)?

c) Are there any associations between different coping strategies at baseline?

1.8.4. Fourth aim: To determine which coping factors are independent predictors of low back pain outcomes for primary care patients and to examine whether changes over time in these predictors are important.

This aim is addressed by answering the following research questions (see Chapters 7 and 8):

a) Which of the coping variables are predictive of future pain intensity and/or disability after adjusting for the demographic variables, pain duration, and all other coping factors?

b) How much of the variance in outcomes is explained by the coping variables?

c) What are the similarities/differences between the independent predictors of pain intensity and disability?

d) How can an important increase or decrease in coping be identified?

e) How many patients changed their coping over time, and did any patterns of change emerge across all of the coping variables?

f) Is change in coping over time affected by potential confounding variables (i.e. employment status and/or pain duration)?

g) Is there a relationship between change in coping over time and low back pain outcome, and if so, does change in coping over time predict low back pain outcome?

h) How does pain duration impact on change in coping over time (e.g. does pain duration predict how coping changes over time, do these variables interact to predict low back pain outcomes)?

1.8.5. Fifth aim: To develop a coping model explaining relationships between key variables and use this model to provide key recommendations that can inform further research and clinical practice.

This aim is addressed by answering the following research questions (see Chapter 9):

a) How can all the thesis results be incorporated within a model to depict the interrelationships between key variables?

b) What recommendations can be made for future research and clinical practice as a result of this coping model?

c) What are the strengths and limitations of the thesis as a whole and how do they impact on the thesis results and recommendations?

The following chapter (see Chapter 2) provides a systematic examination of previous research investigating the role of coping in the prediction of low back pain outcome in order to address the first aim of this thesis.

2. Systematic review – the role of coping in the prediction of low back pain outcome

This chapter reports a systematic review of the literature investigating the role of coping in predicting low back pain outcome. The introduction (section 2.1) and objectives (section 2.2) are followed by a detailed account of the methods used (section 2.3). Results are presented in section 2.4 and discussed in section 2.5.

The objective of this review was to systematically identify important predictors of poor outcome from low back pain in the published literature. Psychological factors, and specifically coping strategies, were identified in chapter 1 of this thesis as being potentially influential in the prediction of low back pain outcome. Therefore this objective reflects an attempt to verify this association from the published literature and identify the coping-related factors that appear to be particularly important.

2.1. Introduction

Chapter 1 highlighted the need for something more than a purely biomedical explanation of the chronic low back pain phenomenon, revealing that coping-related factors have been identified as particularly important in the prediction of future pain and disability (Jensen et al, 2007; Ramirez-Maestre et al, 2008). Various coping-related factors have been studied, such as fear avoidance beliefs (Vlaeyen et al, 1995), self-efficacy (Ayre and Tyson, 2001), control beliefs (Cheng and Leung, 2000), and catastrophizing (Burton et al, 1995), with results demonstrating the relationship between these factors and low back pain outcome.

Chapter 1 also highlighted the problems with current conceptualisations of coping and proposed a different conceptualisation, dividing coping into cognitive and behavioural domains. It is hoped that this conceptualisation might aid the development of a coping model (a primary objective of this thesis), therefore this systematic review will examine cognitive and behavioural coping strategies separately in order to inform the idea of this new conceptualisation further and to facilitate the development of a coping model within this thesis. Turner (1991) stated that models of coping might be useful in explaining adjustment differences among chronic pain populations, therefore highlighting the potential utility of such a model.

In attempting to develop a coping model, familiarity with the literature is important. Systematic reviews provide a succinct account of previous findings, bringing many research studies together and thus aiding interpretation of the findings as a whole. Pincus et al (2002) conducted a systematic review of psychological predictors of low back pain outcome (chronicity/disability), reporting that depression, and to some extent somatization, resulted in an increased risk of chronicity, with the role of other psychological factors (fear avoidance beliefs and catastrophizing) remaining unconfirmed. This is perhaps influenced by the small number of studies that were included in the review. Although the review initially identified 25 relevant studies, only six of these met the acceptability criteria and were used as the basis for the main findings. Pincus et al (2006) also conducted a further systematic review to specifically explore the link between poor prognosis and fear avoidance. Their conclusions were similar to those of their earlier review (2002) in that they found little evidence to link fear avoidance with poor prognosis. In the years since these reviews were conducted, many more studies in this area

have been published. Therefore, this review will summarise study findings and provide an up-to-date synthesis of the evidence.

2.2. Objective

This systematic review aims to determine the role of coping (amongst adults with non-specific low back pain) in the prediction of future pain and disability (chronicity), through the identification of prospective cohort studies focusing on coping with non-specific low back pain.

2.3. Methods

Design

A systematic review of prospective, longitudinal, cohort studies of low back pain patients.

The following section describes the review's inclusion/exclusion criteria and search strategy, and presents an in-depth description of the quality assessment procedure used. Data extraction procedures are discussed, including a presentation of the details of the included studies in two large data extraction tables.

2.3.1. Criteria for considering studies for this review

A two-phase inclusion/exclusion method was used to identify relevant studies for the review. Phase one (initial phase) involved rapid exclusion of studies clearly not addressing the issues covered by the review. The following guide was used for the initial inclusion/exclusion phase:

1) Types of studies

Studies were included in the review if they were empirical, longitudinal and prospective cohort studies that included assessment of coping with low back pain. Cohort studies with prospective designs were selected because they are able to show the influence of coping strategies on subsequent levels of pain and disability. Trials/intervention studies were not included because patient outcome in these studies might be dependent on treatment received, in addition to patient coping strategies. Studies were excluded from the review if they focused either on conditions unrelated to back pain, or on back pain due to traumatic injury, because the main focus of the review was on the condition of non-specific low back pain (see section 2.2 above). Studies were also excluded if they were presented as patient guides, book/study reviews, PhD theses, or a comparison of back pain with other conditions. Only studies published in English (or translated into English) were included in the review, due to the limited translation resources available to the researcher.

2) Types of participants

Studies were included in the review if they focused on low back pain patients. Studies were excluded from the review if they focused on specific demographic/occupational populations (e.g. Finnish reindeer herders, NHS hospital nurses, army personnel), and if they presented data primarily from patients under the age of 18 years. This was because the aim of this review was to investigate the role of coping, specifically amongst adults with low back pain (see section 2.2 above).

3) Types of outcome measurement

Only studies using pain and/or disability as an outcome were included in the review, because the review aimed to determine the role of coping in the prediction of these particular outcome variables (see section 2.2 above).

2.3.2. Search strategy

Studies were identified by searching computerised bibliographic databases (MEDLINE, PsychINFO, and EMBASE) from inception to April 2008. Four main areas were searched (pain, coping, study designs, setting) using the following terms, and the results for each area were combined (using 'and') in order to find studies relating to all aspects of the review question. The search strategy is provided in Box 2.1. Databases of local experts were also searched in order to identify relevant articles. Local experts included the supervisors of this thesis, and other members of staff working within the same department as the reviewer. It was felt that these individuals possessed highly specialised knowledge of the field and

could potentially contribute to the pool of identified studies. A manual search of author names was then performed. Authors of relevant cross-sectional studies (identified through the systematic search) were selected for the manual search to investigate whether the samples had been followed-up and longitudinal analyses subsequently published.

2.3.3. Methods of the review

In the initial exclusion phase, the titles and abstracts of all identified articles were screened by the researcher, and any studies clearly not meeting the inclusion/exclusion criteria were excluded. For any studies where it was unclear if they met the criteria, uncertainties were discussed with a second researcher until an agreement was reached. In phase two, all full text articles were read and studies were subsequently checked against the inclusion/exclusion criteria and either retained or excluded.

2.3.4. Quality assessment

The quality of included studies was assessed using a checklist consisting of 17 items (see table 2.1). A search of the relevant literature revealed no standard quality assessment checklist for use in systematic reviews of prospective cohort studies. This lack of agreed quality assessment was also highlighted by Mallen et al (2006), who stated that where quality assessment does occur within systematic reviews of observational studies, there is no clear consensus about the method

Box 2.1 – Search strategy

MEDLINE search strategy

1) *Pain* MESH headings: Pain, Back pain, Low back pain, Sciatica.
   Free text words: Musculoskeletal pain (title), Chronic pain (title), Back ache, Backache, Sciatica, Lumbago.
2) *Coping* MESH headings: Adaptation psychological, Avoidance learning, Fear, Internal external control, Somatoform disorders, Self efficacy.
   Free text words: Coping, Coper*, Adaptation, Adjustment, Confrontation, Cognitive restructuration, Perceived control, Distraction, Positive thinking, Avoidance, Praying, Helplessness, Hopelessness, Helplessness-hopelessness, (Avoidance OR protective) AND behavio*, Disuse syndrome, Fear-avoidance NEAR model, Fear-avoidance, Fear NEAR avoidance, Catastrophizing, Kinesiophobia, Adaptive NEAR cognitions, Transactional processes, Reinterpreting, Causal attribution, Attentional bias, Self-efficacy, Readiness to change, Acceptance.
3) *Study designs*[1] MESH headings: Prospective studies, Longitudinal studies, Cross-sectional studies, Cohort studies, Questionnaires, Epidemiology, Models theoretical, Review literature, Review (publication type), Editorial (publication type), Health surveys.
   Free text words: Survey*.
4) *Setting* MESH headings: Pain clinics, Primary health care, Family practice.
   Free text words: General population, Primary care.

PsychINFO search strategy

1) *Pain* Thesaurus terms: Pain, Back pain, Pain management, Chronic pain.
   Keywords: Low back pain, Sciatica, Musculoskeletal pain, Back ache, Backache, Lumbago.
2) *Coping* Thesaurus terms: Adjustment, Fear, Somatoform disorders, Coping behavior, Adaptive behavior, Cognitive restructuring, Distraction, Avoidance, Helplessness, Hopelessness, Self efficacy, Readiness to change.
   Keywords: Psychological adaptation, Avoidance learning, Internal-external control, Coping, Coper, Copers, Confrontation, Perceived control, Positive thinking, Praying, Avoidance behaviour, Protective behaviour, Fear-avoidance model, Fear-avoidance, Catastrophizing, Kinesiophobia, Adaptive cognitions, Transactional processes, Reinterpreting, Causal attribution, Attentional bias, Acceptance.
3) *Study designs* Thesaurus terms: Prospective studies, Longitudinal studies, Questionnaires, Theories, Surveys.
   Keywords: Cross-sectional, Cohort studies, Reviews, Editorials, Health surveys.

EMBASE search strategy

1) *Pain* Thesaurus terms: Pain, Backache, Low-back-pain, Musculoskeletal-pain, Chronic-pain.
2) *Coping* Thesaurus terms: Coping -> coping-behavior, Coping-behavior, Coping-strategy -> coping-behavior, Coping-strategy-questionnaire, Adjustment, Fear, Somatoform-disorder, Adaptive-behavior, Avoidance-behavior, Avoidance-behaviour -> Avoidance-behavior, Avoidance-learning -> avoidance-behavior, Helplessness, Hopelessness, Causal-attribution.
   Keywords: Cognitive restructuring, Distraction, Self efficacy, Readiness to change, Psychological adaptation, Confrontation, Perceived control, Positive thinking, Praying, Protective behaviour, Catastrophizing, Kinesiophobia, Adaptive cognitions, Transactional processes, Reinterpreting, Attentional bias, Acceptance.
3) *Study designs* Thesaurus terms: Prospective-study, Longitudinal-study, Questionnaire, Epidemiology, Cross-sectional-study, Cohort-analysis, Health-survey.
   Keywords: Theories, Surveys, Reviews, Editorials.
4) *Setting* Thesaurus terms: Primary-health-care, Pain-clinic, General-practice, General-population, Primary-medical-care.

[1] Although several study designs were not included in the review (e.g. cross-sectional studies.etc.), they were retained in the search strategy as a source of identifying other relevant articles

used. In order to address this issue, Hayden et al[1] recently developed a standard list of assessment criteria for the designing and reporting of low back pain prognosis studies. This list of criteria closely represented a previous list that was also developed by Hayden et al (2006). These criteria formed the foundations of the checklist used in this systematic review. In addition, common themes were identified from previously used checklists and in-line with these findings, some minor alterations were made to the Hayden et al[1] criteria. These alterations were made to incorporate identified quality items that were not addressed by the Hayden et al criteria but that were felt to be relevant to this review. These alterations are highlighted in bold in table 2.1, showing either new criteria (numbers 11 and 12) or additional words used to enhance the clarity of existing criteria (numbers 8 and 13).

The criteria were then used to assess the quality of the studies included in this review. Five studies were independently assessed by two reviewers and results were compared to check scoring reliability and ensure consensus. After comparing these independent assessments, it was felt that there was sufficient reliability (i.e. the two reviewers were scoring in a very similar manner) to enable the main reviewer to continue to assess the remaining studies alone. However, the second reviewer also independently assessed any studies where the scoring was not straightforward, and therefore where a second opinion was required. Items were scored as either yes (Y) if the criterion was met, no (N) if the criterion was not met, or not reported (NR) if the article did not contain enough information to make an accurate assessment. These scores were recorded using a quality assessment table, and studies were then given an overall quality rating in relation to the

[1] Personal communication from K M Dunn (March 2008)

Table 2.1 – Quality assessment checklist

	Quality criteria	Original (Hayden et al[1]) or adapted criteria
1	Is there a rationale for the study?	Original
2	Is a clear study objective/goal defined?	Original
3	Are key elements of study design described (e.g. how were participants identified/recruited)?	Original
4	Are the setting and selection criteria for the study population described?	Original
5	Is the follow-up period appropriate?	Original
6	Are there any strategies to avoid loss to follow-up, or address missing data (e.g. reminders, imputation, sensitivity analysis)?	Original
7	Is the sample size justified?	Original
8	Is information presented about the measurement **instruments used to measure the** prognostic variable(s) **and does this enable replication (through the use of standardised or valid measures)?**	**Adapted (from original criterion)**
9	Is the outcome selected and assessed appropriately?	Original
10	Is the study sample described (demographic/clinical characteristics)?	Original
11	**Is the final sample representative of the study's target population?**	**Adapted (new criterion)**
12	**Is loss to follow-up <20%? If not, are there any significant differences between responders and non-responders to follow-up on baseline variables? If yes, have the implications been considered?**	**Adapted (new criterion)**
13	Are the main results reported (**including** prevalence of prognostic indicator(s) and outcome, strength of association, **and** statistical significance)?	**Adapted (from original criterion)**
14	Is the statistical analysis appropriate and described?	Original
15	Were potential confounders and effect modifiers identified and accounted for (e.g. multivariate analysis)?	Original
16	Do the findings support the authors' interpretations?	Original
17	Do the authors discuss study limitations (e.g. biases/generalisability)?	Original

number of criteria that were met:

- 0-10 criteria met = poor quality
- 11-14 criteria met = acceptable quality
- 15-17 criteria met = high quality

These cut-off points were devised by looking at previous reviews that used similar systems (Pincus et al, 2002; 2006; Williams et al, 2007), and amending these systems in a way that enabled them to be applied to this particular review (i.e. due to the number of criteria used in this review). For example, Williams et al (2007) used a percentage system, where studies meeting less than 50% of the criteria were deemed poor quality, studies meeting between 50% and 74% of the criteria were deemed acceptable quality, and studies meeting at least 75% were deemed high quality. These percentages were used as a guide for the overall quality rating cut-off points in this review.

Due to the subjective nature of quality assessment decisions, none of the studies were excluded from the analysis, presentation of results, or discussion on the basis of achieving a poor quality rating in this quality assessment. This retention of studies, regardless of quality, ensures the presentation of a comprehensive picture of existing evidence, whilst enabling independent assessment of study quality and individual findings (Pincus et al, 2002). A sensitivity analysis was also performed, detailing how the results of this review would have differed if the poor quality studies had been excluded.

2.3.5. Data extraction

Data extraction was performed by the main reviewer, using a standard extraction table that was developed specifically for use in this review. A second reviewer assisted with data extraction when ambiguities arose, to ensure reliability of the extracted data. The following information was extracted from each of the eligible articles: country/place of study, follow-up period, setting, predictors (coping-related factors), outcomes and when they were measured, measures used, age and sex of participants, initial sample size and response rates, summary of results and conclusions, and the predictors or risk factors that significantly predict outcomes. Significant associations were defined as p values <0.05, odds ratios or relative risk ratios greater than 1 with 95% confidence intervals not crossing 1.

Important baseline prognostic indicators were identified, with particular attention being given to factors that were found to be predictive by high quality studies. In addition, it is important to identify larger studies (n = at least 250 at final follow-up), as their estimates of prediction are more precise due to their smaller confidence intervals. It is important to remember that large studies can also be fundamentally flawed, but it is hoped that the quality assessments presented will enable a closer examination of these studies so that any flaws can be detected and independently assessed. An arbitrary cut-off of n = at least 250 was chosen as a criterion of convenience.

2.4. Results

This section describes the results of the systematic review, providing a description of the studies included (study selection, characteristics and quality), followed by a detailed description of the findings. Findings for behavioural and cognitive coping will be presented separately, followed by a sensitivity analysis based on the quality assessment of the included studies. Sensitivity analysis is a method of assessing the robustness of a systematic review whereby the findings are re-examined after changes in any underlying assumptions are made (Bowling and Ebrahim, 2005). Most often, this involves including or excluding studies on the basis of their quality. Due to the high degree of heterogeneity amongst the included studies (in terms of study populations, prognostic indicators, outcomes, measurement instruments, and statistical analyses used), data could not be pooled for statistical analysis. Therefore, results are presented in the form of a narrative summary.

2.4.1. Description of studies

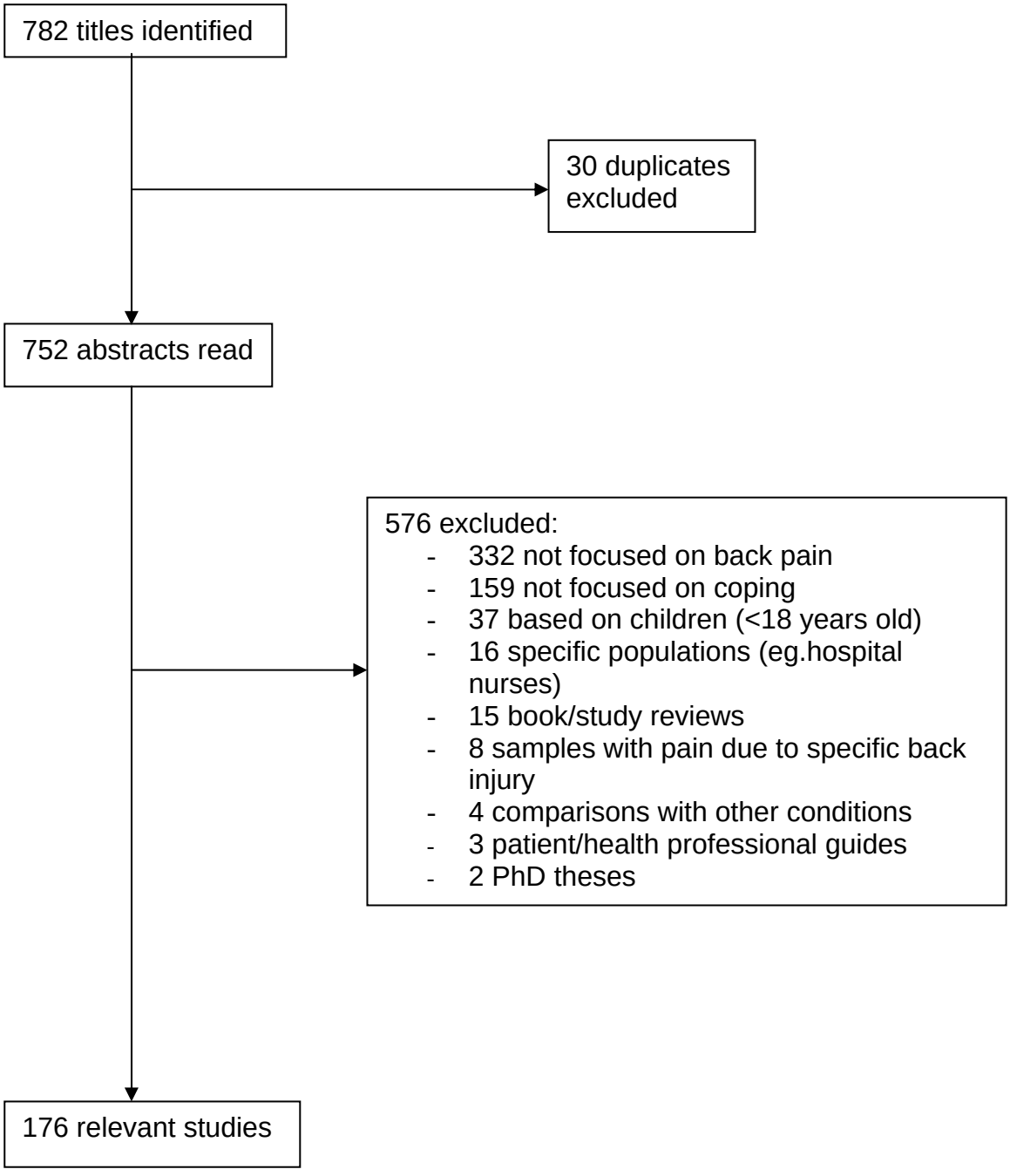
Presented below are the results of study selection, along with a description of the study characteristics and the range of quality assessment scores.

Selection of studies

A total of 782 citations were screened (MEDLINE 405, PsychINFO 265, EMBASE 112) and 30 duplicates were identified and excluded. The remaining 752 abstracts were read, and a further 576 articles were excluded (see Figure 2.1). The main

reasons for exclusion were studies that did not focus on back pain (n = 332) or coping (n = 159). Other reasons for exclusion included the assessment of under 18 year olds, studies focusing on specific populations, and non-empirical studies.

Figure 2.1 – Results of systematic search and selection of studies



The remaining 176 full text articles were read and a further 154 were excluded (see figure 2.2). Many articles were excluded because they did not meet the inclusion criteria (e.g. they used a cross-sectional design, had a methodological or intervention focus, or a focus that was not relevant to this review). These studies were unable to help in determining the role of coping in the prediction of poor outcome from low back pain. They were therefore excluded, leaving a total of 22 relevant studies.

Manual searching of author names identified a further 7 relevant studies, therefore resulting in a total of 29 relevant prospective studies that were included in the review (see figure 2.2).

Types of studies and settings

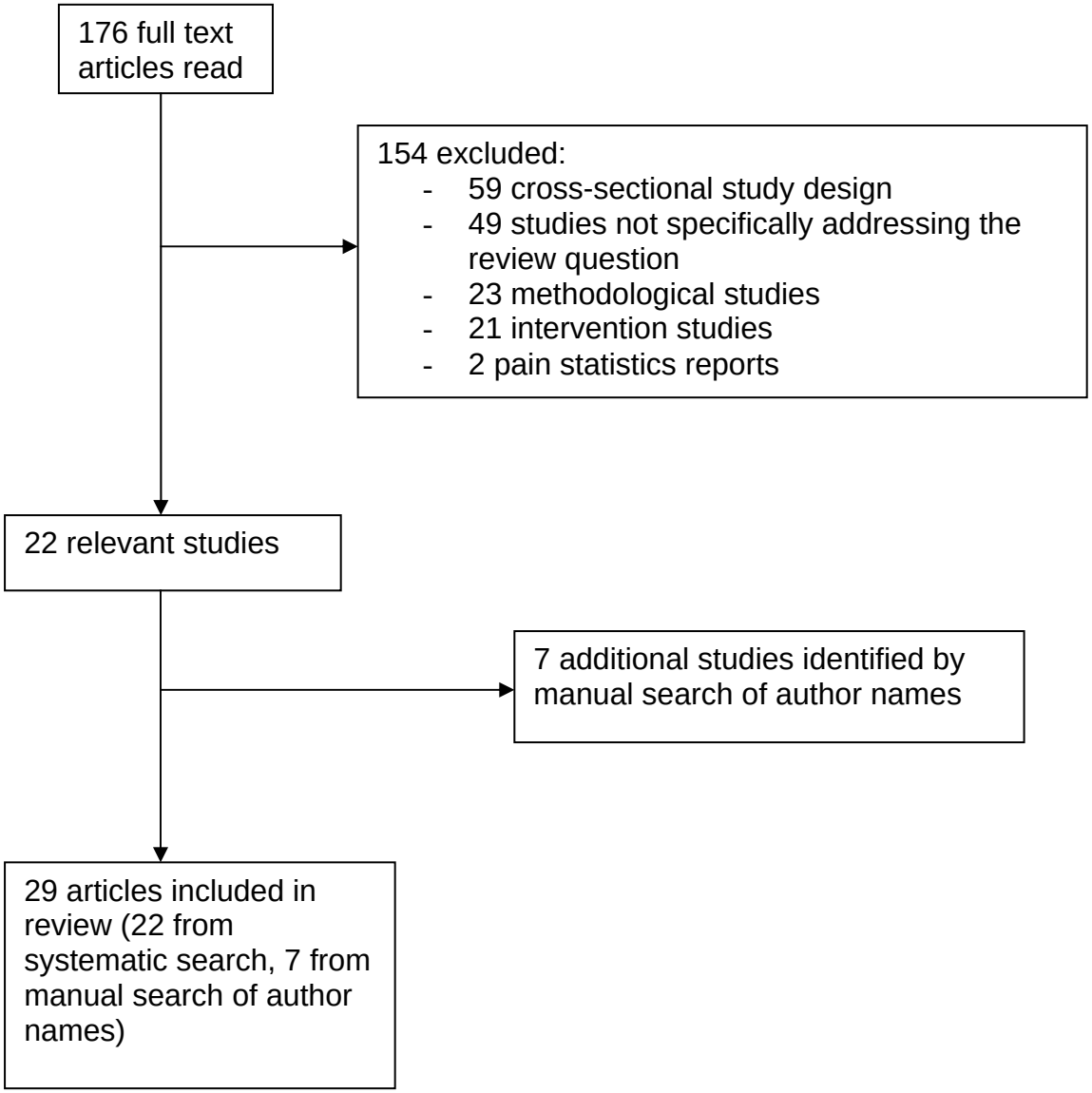
In total, 29 studies were included in the systematic review. Data extraction table A (see table 2.2) provides details of the study settings. Nineteen studies used a primary care, general population, or pain clinic/hospital pain centre sample. Three studies used a sample consisting of both primary care and hospital clinic patients, and the remaining seven studies utilised either a workplace sample, or secondary care, treatment programme, or orthopaedic practice patients.

Study participants and length of follow-up

Details of the study participants are presented in data extraction table B (see table 2.3), and details of the length of follow-up are presented in data extraction table A (see table 2.2). The sample size varied greatly across the studies, ranging from 30 to 1,888 participants at final follow-up, with a mean sample size of 368

participants. The majority of study samples consisted of more female than male participants and the length of follow-up ranged from two weeks (Kovacs et al, 2005) to five years (Weir et al, 1994), with a mean follow-up period of 9.89 months.

Figure 2.2 – Results of screening and final selection of articles



Outcome domains and measurement

Details of the outcome domains and measurement instruments used within each of the included studies are presented in data extraction table A (see table 2.2). Studies included in the review used 12 different outcome domains at follow-up. The most frequently used were disability or functioning (measurement instruments used were: Roland-Morris Disability Questionnaire, Orebro Screening Questionnaire, Oswestry Disability Index, Quebec Back Pain Disability Scale, Sickness Impact Profile, Chronic Pain Questionnaire), and pain intensity or severity (measurement instruments used were mainly visual analogue or numeric or verbal rating scales). Also frequently used was the assessment of the course of low back pain, although this was measured in different ways across the studies (e.g. chronicity, presence, duration, number of pain days, persistence.etc.), and usually through the use of single questions. Other outcomes included work status (e.g. sick leave, absenteeism, return to work), presence or prevalence of low back pain, healthcare utilisation, quality of life, pain behaviours, specialist consultation, use of medication, participation, and psychosocial adjustment to illness. Although several studies used the same outcome domains (e.g. disability or functioning), they frequently used different outcome measures (e.g. the studies including disability or functioning as an outcome domain used a total of six different measures).

Additional information

The two data extraction tables also contain information on the country or place of study and predictors (see table 2.2), as well as the age of participants, response rates, overall quality assessment scores, summary of results and conclusions, and the predictors/risk factors that significantly predicted outcomes (see table 2.3).

2.4.2. Quality assessment

Quality assessment scores are presented in table 2.4. Scores ranged from 10 to 16 from a maximum of 17 (mean = 12.86). Four of the criteria (1: rationale for the study; 8: standardised/valid measurement of prognostic variable(s); 9: appropriate selection and assessment of outcome; 16: interpretations supported by findings) were achieved by all studies whereas two criteria (7: justification of sample size; 11: sample representative of target population) were only achieved by one (Heneweer et al, 2007) and two studies (Jones et al, 2006; Keeley et al, 2008) respectively.

In terms of overall quality, the majority of studies (n = 23) were rated as being of acceptable quality (Asghari and Nicholas, 2001; Boersma and Linton, 2006; Ciechanowski et al, 2003; Dionne et al, 2007; George et al, 2006; Gheldof et al, 2007; Grotle et al, 2006; Heneweer et al, 2007; Keeley et al, 2008; Klenerman et al, 1995; Kovacs et al, 2007; Kovacs et al, 2005; Leeuw et al, 2007; McCracken and Eccleston, 2005; Mercado et al, 2005; Neubauer et al, 2006; Poiraudeau et al, 2006; Potter and Jones, 1992; Reis et al, 1999; Severeijns et al, 2005; Sieben et al, 2005; Sieben et al, 2002; Weir et al, 1994), four studies were rated as high

quality (Jones et al, 2006; Picavet et al, 2002; Soucy et al, 2006; Swinkels-Meewisse et al, 2006), and two studies were rated as poor quality (Boersma and Linton, 2005; Potter et al, 2000). All four of the high quality studies used large sample sizes (n = at least 250 at final follow-up). There were also five studies of acceptable quality that used large sample sizes (Dionne et al, 2007; Gheldof et al, 2007; Mercado et al, 2005; Poiraudeau et al, 2006; Severeijns et al, 2005). Therefore, a total of nine of the 29 studies used large sample sizes.

2.4.3. Main findings – prognostic indicators

Presented here is a detailed narrative summary of the main findings of this systematic review.

Of all the psychological prognostic indicators measured, 15 different coping factors were found to be associated with outcome in at least one study. The factor that was considered to be the most important prognostic indicator (due to the frequency and consistency of the evidence) was fear avoidance beliefs/kinesiophobia. Several other factors were also identified, either because they were found to be predictive of outcome more frequently or by the higher quality and larger studies, or because of the consistency of the evidence for their prognostic role. These factors were passive coping strategies, depression, catastrophizing, anxiety, negative affect, and self-efficacy. This section will address each of these factors, providing a summary of the evidence for their role in the prediction of low back pain outcome.

Table 2.2 – Data extraction table A: Design characteristics

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
2	Asghari, A. & Nicholas, M. (2001)	Not specified (Australia?)	3, 6, and 9 months	Pain clinic/hospital pain centre	Pain self-efficacy beliefs Depression (controlled for) Neuroticism (controlled for) Catastrophizing (controlled for)	Pain behaviours – BL & FU (all occasions)	PSEQ PBPI PLCQ Beck Depression Inventory (BDI) NEO-PI-R Catastrophizing subscale of the CSQ Pain behaviour questionnaire (PBQ)
7	Boersma, K. & Linton, S. (2006)	Sweden	12 months	Primary care	Negative affect Fear avoidance beliefs Expectancy of persistent pain	Expectancy of persistent pain – BL Average pain (last 3 months) – BL & FU Functional disability – BL & FU	Pain Discomfort Scale (PDS) TSK “In your view, how large is the risk that your current pain may become persistent?” (Taken from the Orebro Screening Questionnaire)

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
							Outcome Evaluation Questionnaire Roland Morris Disability Questionnaire (RM-18)
8	Boersma, K. & Linton, S. (2005)	Sweden	12 months	Primary care	Clustered patients into subgroups on:- Fear avoidance beliefs Depressed mood	Pain intensity – BL & FU Functional ability – BL & FU Long-term sick leave (>15 days) - FU	Orebro Screening Questionnaire for Pain
11	Ciechanowski, P. et al (2003)	America (Seattle)	12 months	Treatment programme participants	Attachment style Catastrophizing (controlled for) Depression (controlled for)	Health care utilisation – BL & FU	Relationship Scale Questionnaire (RSQ) Catastrophizing subscale of the CSQ The Centre for Epidemiological Studies-Depression Scale (CES-D) Number of pain-related visits in last 3 months
16	Dionne, C. et al (2007)	Quebec City, Canada	6 and 12 weeks, 12 and 24 months	Primary care	Fear-avoidance beliefs (work and activity) Depression and	Return to work in good health – FU (all occasions)	FABQ Symptom Checklist-90 Revised

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
					somatization Self-efficacy		Self-developed measure of self-efficacy RWGH
24	George, S. et al (2006)	America (Pittsburgh)	4 weeks	Treatment programme patients	Fear avoidance beliefs	Disability – BL & FU Pain intensity – BL & FU	FABQ Oswestry Disability Questionnaire (ODQ) Numeric rating scale
31	Jones, G. et al (2006)	North West England (Cheshire)	3 months	Primary care	Active/passive coping strategies	Persistent disabling low back pain (pain intensity and disability) – BL & FU	Vanderbilt Pain Management Inventory VAS RMDQ
34	Klenerman, L. et al (1995)	Merseyside, UK	2 and 12 months	Primary care	Fear avoidance variables (stressful life events, personality, coping strategies – medication taking, resting, going to the doctor, taking physical exercise, ignoring pain) Depression	Pain and disability – BL & FU (all occasions) Sick leave – BL & FU (all occasions) Course of back pain at 12 months – FU (12 months only)	Rating scale, Modified Somatic Perception Questionnaire (MSPQ), rating scales Modified Zung Depression Inventory Pain severity rating RMDQ/Oswestry Disability Scale

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
							Single questions on work status and course of back pain
35	Kovacs, F. et al (2007)	Spain	14 days and 12 months	Primary care + hospital clinics	Fear-avoidance beliefs QoL – physical and mental	Sick leave duration – BL & FU (12 months only)	FABQ SF-12 Social Security database information
36	Kovacs, F. et al (2005)	Spain	14 days	Primary care + hospital clinics	Fear avoidance beliefs	Disability – BL & FU QoL – physical and mental – BL & FU	FABQ RMDQ SF-12
38	Leeuw, M. et al (2007)	The Netherlands	6 months	General population	Catastrophizing Fear of movement/(re)injury (general population) Fear of movement/(re)injury (LBP)	Functional disability – BL & FU Fear of movement/(re)injury (LBP) – FU	PCS TSK-G (general population) TSK-SV (short version) Single question Quebec Back Pain Disability Scale (QBPDS)
47	McCracken, L. & Eccleston, C. (2005)	South West UK	3.9 months (average)	Pain clinic/hospital pain centre	Acceptance of chronic pain (activity engagement, pain willingness)	Depression – BL & FU Anxiety – BL & FU	Chronic Pain Acceptance Questionnaire (CPAQ)

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
						Disability – BL & FU Functioning (including medication taking) – BL & FU	BDI Pain Anxiety Symptoms Scale (PASS) Sickness Impact Profile (SIP) VAS
50	Neubauer, E. et al (2006)	Germany	6 months	Orthopedic practice setting	Cognitive strategies of pain management (ie. helplessness, catastrophizing and endurance) Psychosomatic co-morbidities Subjective well-being, worries and emotions Depression	Prevalence of LBP – FU	KSI MSPQ Freiburg Personality Inventory (FPI) Zung Depression Index Single question for prevalence
52	Picavet, H. et al (2002)	The Netherlands	6 months	General population	Catastrophizing Kinesiophobia	Pain (prevalence, duration and severity) – BL & FU Disability – BL & FU	PCS TSK (modified) Single questions QBPDS
56	Potter, R. et al	UK	12 weeks	Primary care	Distress	Pain intensity – BL &	VAS

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
	(2000)				Active/passive coping Medication taking	FU	Pain Management Inventory (PMI) Single question Verbal Rating Scale (VRS)
57	Potter, R. & Jones, J. (1992)	Cheshire, UK	12 and 26 weeks	Primary care	Anxiety & Depression Active/passive coping	Pain (acute/chronic) – FU (all occasions) Pain intensity – BL & FU (all occasions)	Goldberg's brief questionnaire PMI Single question VAS
58	Reis, S. et al (1999)	Israel	2 months	Primary care	Depression	Presence of back pain – FU	3-question screening tool Single question
64	Severeijns, R. et al (2005)	The Netherlands	6 months	General population	Catastrophizing	Chronicity (duration >3 months) – BL & FU Specialist consultation – BL & FU Use of medication – BL & FU Absenteeism – BL & FU	PCS Single questions for outcomes

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
65	Sieben, J. et al (2005)	The Netherlands	3, 6, and 12 months	Primary care	Negative affect Catastrophizing Pain-related fear Avoidance of physical activity Depression	LBP outcome – BL & FU (all occasions)	Negative Emotionality Scale (NEM) PCS TSK Physical Activity Rating Scale (PARS) BDI Graded Chronic Pain Scale (GCPS)
71	Swinkels-Meewisse, I. et al (2006)	The Netherlands	6 weeks and 6 months	Primary care	Pain-related fear	Disability – BL & FU (all occasions) Participation – BL & FU (all occasions)	TSK Roland Disability Questionnaire (RDQ) Chronic Pain Grade Questionnaire
80	Weir, R. et al (1994)	Not specified (Canada?)	3-5 years	Pain clinic/hospital pain centre	Meaning of illness factors	Psychosocial adjustment to illness – FU	Meaning of Illness Questionnaire (MIQ) Psychosocial Adjustment to Illness Scale (PAIS-SR)
85	Heneweer, H. et al (2007)	The Netherlands	2, 4, 8 and 12 weeks	Primary care	Fear avoidance beliefs Kinesiophobia	Pain intensity – FU (all occasions) Disability – FU (all	FABQ TSK

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
					Pain-coping behaviour – active/passive coping Psychological factors & fear avoidance beliefs	occasions) Overall improvement – FU (12 weeks only)	Pain Coping Inventory (PCI) Acute Low Back Pain Screening Questionnaire (ALBPSQ) VAS QBPDS 2 questions: recovery; work absenteeism (yes/no)
86	Gheldof, E. et al (2007)	Belgium and the Netherlands	18 months	Workplace – industrial companies (mostly part of metallurgical or steel industry)	Fear of (re)injury due to movement Fear of work-related activities Negative affectivity Psychological distress	Number of pain days in the past year – BL & FU	TSK-AV (adapted version) or TSK-G (general population) FABQ (work subscale) Positive and Negative Affect Schedule (PANAS) General Health Questionnaire-Short Version (GHQ-12) Nordic Questionnaire on LBP

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
87	Grotle, M. et al (2006)	Norway	3, 6, 9 and 12 months	Primary care + pain clinic	Medication taking Fear avoidance beliefs Emotional distress	Pain intensity – BL & FU (all occasions) Disability – BL & FU (all occasions)	Single question FABQ Hopkin's Symptom Check List (HSCL-25) Numeric rating scale (NRS) Oswestry Disability Index (ODI)
88	Keeley, P. et al (2008)	Manchester, UK	6 months	Orthopaedic outpatient clinic	Anxiety & depression Fear avoidance beliefs Social stress	Physical health-related quality of life – BL & FU Health service utilisation – FU	HADS FABQ Life Events and Difficulties Schedule (LEDS) SF-36 Physical Component Score Client Socio-Demographic and Service Receipt Inventory (CSSRI)
89	Mercado, A. et al (2005)	Canada	6 and 12 months	General population	Active/passive coping Depressive symptoms (controlled for)	Disability – BL & FU (all occasions)	PMI CES-D

ID No.	Author & Year	Country/ place of study	Follow-up period	Setting	Predictors (coping strategies/ psychological factors)	Outcomes and when they were measured	Measures used
							Chronic Pain Questionnaire
90	Poiraudeau, S. et al (2006)	France	3 months	Secondary care	Medication taking Anxiety & depression Fear avoidance beliefs	Persistence of back pain – FU	Single questions HADS FABQ Single question: "Has your low back pain persisted since your visit to your rheumatologist 3 months ago?"
91	Sieben, J. et al (2002)	Belgium and the Netherlands	14 days and 3 and 12 months	Primary care	Pain-related fear Catastrophizing	Disability – BL & FU (all occasions) Pain intensity – BL & FU (14 days only)	TSK PCS RDQ VAS diary
92	Soucy, I. et al (2006)	Not specified (Canada?)	6 months	Workplace – workers on sick leave receiving income replacement benefits	Fears and beliefs about work Stress at work	Work status – FU	FABQ JCQ Single question

Table 2.3 – Data extraction table B: Results

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
2	Asghari, A. & Nicholas, M. (2001)	Mean = 50.26 SD = 13.25 59% female 41% male	Initial = 234 BL = 183 (78% of initial) FU1 = 160 (88% of BL) FU2 = 150 (81% of BL) FU3 = 145 (79% of BL)	13	Baseline self-efficacy independently predicted total pain behaviour (10% of the variance) and avoidance behaviour (12% of the variance, B = -0.45), however it did not predict complaint behaviour (1% of the variance, B = -0.11). Higher pain self-efficacy beliefs are predictive of reduced avoidance behaviours	Pain self-efficacy beliefs
7	Boersma, K. & Linton, S. (2006)	21 – 61 years Mean = 47.7 SD = 8.3 80% female 20% male	BL = 158 FU = 141 (89% of BL)	13	Negative affect, expectancy, and fear avoidance beliefs explained unique variance in both pain and functional disability at follow-up (an additional 14% and 15% of the variance respectively)	Negative affect Expectancy Fear avoidance beliefs
8	Boersma, K. & Linton, S. (2005)	22 – 68 years Mean = 47 SD = 10.2 63% female 37% male	BL = 363 Used = 185 cluster analysed, 178 for cross validation	10	Subgroups of patients (clustered according to fear avoidance and distress) were clearly related to outcome (cluster analysis), suggesting that fear avoidance and distress are important factors in the development of pain-related disability	Fear avoidance beliefs Depressed mood
11	Ciechanowski, P. et al (2003)	Mean = 44.7 SD = 10.7 55% female 45% male	BL = 140 FU = 111 (79% of BL)	13	The results suggest an association between attachment style and adjustment. Preoccupied attachment style was a significant predictor of having greater than weekly pain-related healthcare	Attachment style

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
					visits (B = 1.89)	
16	Dionne, C. et al (2007)	18 – 64 years 41.5% female 58.5% male	BL = 1,007 FU1 = 923 (92% of BL) FU2 = 907 (90% of BL) FU3 = 913 (91% of BL) FU4 = 864 (86% of BL)	13	In both genders, fear avoidance beliefs about work were associated with failure to return to work (males: OR = 4.08, CI = 1.76 – 9.44; females: OR = 3.01, CI = 1.14 – 7.91) and high self-efficacy was associated with success (males: OR = 0.21, CI = 0.07 – 0.68; females: OR = 0.69, CI = 0.51 – 0.91). In women only, fear avoidance beliefs about activity were also associated with failure (OR = 1.98, CI = 1.01 – 3.89)	Fear avoidance beliefs Self-efficacy
24	George, S. et al (2006)	Mean = 38.4 SD = 10.2 58% female 42% male	BL & FU = 63	11	Changes in fear avoidance beliefs explained significant amounts of the variance in changes in average pain intensity (20% of the variance, B = 0.16, CI = 0.08 – 0.24, p< 0.001) and disability (19% of the variance, B = 1.03, CI = 0.48 – 1.58, p< 0.001)	Fear avoidance beliefs
31	Jones, G. et al (2006)	18 – 65 years Median = 47 IQR = 38 – 56 59% female 41% male	Initial = 1917 BL = 974 (51% of initial) FU = 922 (95% of BL)	16	People with high passive coping scores experienced a significant increase in the risk of poor short-term outcome (RR = 1.5, CI = 1.1 – 2.0). There was no association between active coping and low back pain at follow-up	Passive coping strategies
34	Klenerman, L. et al (1995)	No age info 49.7%	Initial = 300 FU2 = 123 (41% of initial)	11	Fear avoidance variables were the most successful in predicting	Fear avoidance variables

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
		female 50.3% male			outcome (25% of the variance at 2 months, 14% of the variance at 12 months)	
35	Kovacs, F. et al (2007)	Median = 45.8 IQR = 38.9 – 54.2 53.9% female 46.1% male	Initial = 209 BL/FU = 165	13	Each additional point in the total fear avoidance beliefs baseline score increased by 2.4% the odds of being on sick leave for up to 60 days during the following year (p< 0.05) and by 7.7% the odds of being on sick leave for 61 days or more (p< 0.001). Baseline differences in physical and mental quality of life were also associated with differences in sick leave throughout the study period (p< 0.001 and p< 0.01 respectively)	Fear avoidance beliefs Quality of life
36	Kovacs, F. et al (2005)	Median = 45.7 IQR = 38.8 – 54.3 57.9% female 42.1% male	n = 209	12	There was no interaction between fear avoidance beliefs and chronicity, and FABQ values on day 1 did not predict disability or quality of life on day 15 (2% of the variance in disability; 4% of the variance in physical QoL; 0% of the variance in mental QoL)	None
38	Leeuw, M. et al (2007)	25 – 65 years Mean = 47.31 SD = 10.66 62% female 38% male	Initial = 8,000 BL = 3,664 (46% of initial) FU = 1,581 Used = 152	12	Fear of movement/(re)injury was related to functional disability (B = 0.26, p< 0.001) but only cross-sectionally (both measured at follow-up)	None
47	McCracken, L. &	Mean =	n = 118	12	Acceptance scores consistently	Acceptance

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
	Eccleston, C. (2005)	44.2 SD = 10.7 64% female 36% male			predicted functioning in a positive fashion (6.3% - 29.0% of the variance)	
50	Neubauer, E. et al (2006)	18 – 70 years Mean = 39.49 SD = 11.90 56% female 44% male	BL = 235 FU = 193 (82% of BL) Used = 192	13	Depression was predictive in the development of chronicity (OR = 1.424, CI = 1.11 – 1.82, p< 0.01), and patients with a high total score on the scales assessing catastrophizing and helplessness had a higher risk for chronicity (OR = 1.157, CI = 1.05 – 1.28, p< 0.01 and OR = 0.943, CI = 0.89 – 0.99, p< 0.05 respectively)	Depression Catastrophizing Helplessness
52	Picavet, H. et al (2002)	25 – 64 years 57.3% female 42.7% male	Initial = 8,000 BL = 3,664 FU = 1,571	15	For people with and without low back pain at baseline, a high level of catastrophizing predicted pain and disability at follow-up (with: ORs = 1.7 – 3.7; without: ORs = 2.1 – 3.1). A high level of kinesiophobia showed similar associations (with: ORs = 1.6 – 4.4; without: OR (disability) = 3.4)	Catastrophizing Kinesiophobia
56	Potter, R. et al (2000)	18 – 65 years 58.9% female 41.1% male	Initial = 203 BL = 196 FU = 141 (69% of initial)	10	Active coping score was independently predictive of chronicity (p = 0.014)	Active coping
57	Potter, R. & Jones, J. (1992)	18 – 65 years 68.9% female	BL = 48 FU = 45	11	There was a higher incidence of depression in the group that subsequently developed chronic pain (p< 0.05). Passive coping was	Depression Passive coping

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
		31.1% male			correlated with pain intensity (correlation coefficient = 0.48, p< 0.05) and this relationship appeared more strongly positive with duration of pain	
58	Reis, S. et al (1999)	Mean = 46 SD = 13.1 51% female 49% male	BL = 238 FU = 219 (92% of BL)	13	Depression was one of the strongest predictors of chronicity (OR = 5.0, p< 0.05)	Depression
64	Severeijns, R. et al (2005)	25 – 78.6 years 55.6% female 44.4% male	Initial = 8,000 BL = 3,664 FU = 1,888	13	Catastrophizing increased the odds for development of chronic pain (OR = 1.18, CI = 1.02 – 1.37)	Catastrophizing
65	Sieben, J. et al (2005)	18 – 60 years 43.7% female 56.3% male	Initial = 464 BL = 220 FU1 = 180 FU2 = 168 FU3 = 171	14	Of the fear avoidance model variables, only negative affect was included in the final model explaining end of study Graded Chronic Pain Scale scores (Spearman's rho = 0.215, p< 0.05)	Negative affect
71	Swinkels-Meewisse, I. et al (2006)	18 – 65 years Mean = 42.4 SD = 11.3 42% female 58% male	BL = 615 FU1 = 467 FU2 = 431	15	Baseline fear of movement/(re)injury significantly predicted future perceived disability (B = 0.23, p< 0.001) and contributed to the prediction of future participation (B = -0.10, p< 0.05)	Fear of movement/(re)injury
80	Weir, R. et al (1994)	No age info 61.2% female 38.8% male	Initial = 571 BL/FU = 222	11	70% of the variance in adjustment to chronic pain was explained by social and cognitive variables. The MIQ 5-factor structure was supported and provided credible	Meaning of illness factors

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
					evidence for the role of cognitions in differentiating between poorly adjusted and well-adjusted patients	
85	Heneweer, H. et al (2007)	21 – 60 years 39.3% female 60.7% male	BL = 66 FU (3mth) = 56	14	The variables were not significantly associated with non-recovery at 3 months follow-up (p> 0.05)	None
86	Gheldof, E. et al (2007)	18 – 65 years Mean = 39.82 SD = 8.24 10% female 90% male	Initial = 11,960 BL = 1,294 FU = 812 (63% of BL)	14	Negative affect was found to be a risk factor for the development of short-term low back pain (OR = 1.06, CI = 1.01 – 1.11, p< 0.05). High fear of movement/(re)injury increased the risk of failure to recover from short-term low back pain (OR = 1.07, CI = 1.02 – 1.12, p< 0.01). High fear of work-related activities heightened the risk of developing long-term low back pain (OR = 1.04, CI = 1.00 – 1.08, p< 0.05)	Fear of movement/(re)injury Fear of work-related activities Negative affect
87	Grotle, M. et al (2006)	18 – 60 years 57.2% female 42.8% male	BL = 123 acute, 50 chronic FU (12mth) = 112 acute, 47 chronic	14	In the acute sample, fear avoidance beliefs about work predicted pain and disability at 12 months follow-up (B = 0.21, p< 0.05 and B = 0.22, p< 0.05 respectively). In the chronic sample, fear avoidance beliefs about activity predicted disability at 12 months follow-up (B = 0.30, p< 0.05). However, distress was a stronger predictor than fear avoidance beliefs (acute – pain: B =	Fear avoidance beliefs Distress

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
					0.28, p< 0.01; acute – disability: B = 0.52, p< 0.001; chronic – disability: B = 0.48, p< 0.01)	
88	Keeley, P. et al (2008)	18 – 65 years Mean = 39.9 SD = 12.2 41.9% female 58.1% male	Initial = 120 BL = 108 (90% of initial) FU (SF-36) = 93 (86% of BL) FU (CSSRI) = 86 (80% of BL)	13	Baseline HADS total score and social stress were independent predictors of SF-36 Physical Component Score at follow-up (B = -0.27, p< 0.01 and B = -0.42, p< 0.001 respectively). Fear avoidance beliefs about work independently predicted the number of healthcare contacts during the study period (incident rate ratio = 1.02, CI = 1.01 – 1.03, p< 0.01)	Anxiety Depression Social stress Fear avoidance beliefs about work
89	Mercado, A. et al (2005)	20 – 69 years Mean = 44.3 SD = 12.6 50.3% female 49.7% male	Initial = 2,184 BL = 1,131 FU1 = 846 (74.8% of BL) FU2 = 711 (62.9% of BL) Used = 571	13	Passive coping was a strong independent risk factor for disabling back pain. People who reported a moderate level of passive coping strategies were more than 5 times more likely to develop disabling pain than people reporting a low level of passive coping (HRR = 5.19, CI = 1.78 – 15.1). People who reported high passive coping were 6.80 times more likely to develop pain (CI = 2.36 – 19.6). Active coping was not found to be a risk factor (crude HRR = 0.96, CI = 0.90 – 1.03)	Passive coping
90	Poiraudeau, S. et al (2006)	Mean = 42.8 SD = 9.5	BL = 443 FU = 440 (99% of BL)	14	Anxiety and beliefs about work-related back pain were found to be determinants of outcome (OR =	Anxiety Fear avoidance beliefs

ID No.	Author & Year	Age & Sex	Initial sample size & Response rates	Overall quality score	Summary of results/conclusions	Significant predictors/risk factors
		41.6% female 58.4% male			2.41, CI = 1.44 – 4.09 and OR = 1.02, CI = 1.00 – 1.05 respectively)	about work
91	Sieben, J. et al (2002)	18 – 65 years Mean = 42.7 SD = 10.8 50% female 50% male	BL = 44 FU1 = 34 (77.3% of BL) FU2 = 33 (75% of BL) FU3 = 30 (68.2% of BL)	12	Patients with rising levels of pain-related fear over time were more disabled at 1 year follow-up (p< 0.05)	Pain-related fear
92	Soucy, I. et al (2006)	18 – 60 years Mean = 39 SD = 9.6 43% female 57% male	Initial = 3,326 BL = 437 FU = 292 Used = 258	15	Fears about work and stress at work increased the risk of chronic disability (OR = 0.38, CI = 0.25 – 0.58, p< 0.001 and OR = 0.44, CI = 0.20 – 0.94, p< 0.05 respectively). Fears and beliefs about work had the greatest effect on return to work (OR = 0.37, CI = 0.25 – 0.53, p< 0.001)	Fears and beliefs about work Stress at work

Table 2.4 – Quality assessment scores

Study ID no.	Quality criteria																Overall quality assessment score
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
2	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	N	Y	Y	Y	Y	13
7	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	NR	NR	N	Y	Y	Y	Y	13
8	Y	Y	N	Y	Y	N	N	Y	Y	Y	NR	NR	Y	Y	N	Y	N	10
11	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	Y	N	Y	Y	13
16	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	N	Y	Y	Y	Y	13
24	Y	Y	Y	Y	N	N	N	Y	Y	Y	NR	NR	Y	Y	Y	Y	N	11
31	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	16
34	Y	N	Y	Y	Y	Y	N	Y	Y	N	NR	Y	N	Y	Y	Y	N	11
35	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	N	13
36	Y	Y	Y	Y	N	N	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	N	12
38	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	N	N	Y	Y	Y	Y	12
47	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	N	N	Y	Y	Y	Y	12
50	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	N	Y	Y	Y	Y	13
52	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	15
56	Y	N	Y	N	Y	N	N	Y	Y	Y	NR	N	Y	Y	Y	Y	N	10
57	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	N	N	Y	N	11
58	Y	N	Y	Y	N	Y	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	13
64	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	N	Y	Y	Y	Y	13
65	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	NR	N	Y	Y	Y	Y	Y	14
71	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	15
80	Y	Y	Y	N	Y	N	N	Y	Y	Y	NR	N	Y	Y	Y	Y	N	11
85	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	NR	Y	N	Y	Y	Y	Y	14
86	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	14
87	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	14
88	Y	Y	Y	Y	Y	N	N	Y	Y	Y	Y	N	Y	Y	Y	Y	N	13
89	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	N	13
90	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	14

Study ID no.	Quality criteria																	Overall quality assessment score
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	
91	Y	Y	Y	Y	Y	N	N	Y	Y	Y	NR	Y	N	Y	N/A	Y	Y	12
92	Y	Y	Y	Y	Y	Y	N	Y	Y	Y	NR	Y	Y	Y	Y	Y	Y	15
Total number of studies meeting each criteria	29	26	28	27	26	8	1	29	29	28	2	20	19	28	25	29	19	

Y = Yes (criterion met)
N = No (criterion not met)
NR = No (criterion not reported)

Fear avoidance beliefs/kinesiophobia

Eighteen studies investigated the prognostic role of fear avoidance beliefs/kinesiophobia on low back pain outcome. Fourteen of these studies (78%) found evidence that these fearful beliefs were significant prognostic indicators (Boersma and Linton, 2006; Boersma and Linton, 2005; Dionne et al, 2007; George et al, 2006; Gheldof et al, 2007; Grotle et al, 2006; Keeley et al, 2008; Klenerman et al, 1995; Kovacs et al, 2007; Picavet et al, 2002; Poiraudeau et al, 2006; Sieben et al, 2002; Soucy et al, 2006; Swinkels-Meewisse et al, 2006), with several of these studies utilising multivariate analysis techniques. Four studies did not find them to be significantly predictive (Heneweer et al, 2007; Kovacs et al, 2005; Leeuw et al, 2007; Sieben et al, 2005). Amongst the 14 studies that did find fearful beliefs to be significantly predictive of outcome, three were high quality studies with large sample sizes (n(a) = 1,571 [Picavet et al, 2002], n(b) = 431 [Swinkels-Meewisse et al, 2006], n(c) = 258 [Soucy et al, 2006] at final follow-up). All three of these studies reported either kinesiophobia or fears and beliefs about work to be a risk factor for poor low back pain outcome. Specifically, they reported that these fearful beliefs predicted (a) pain and disability at follow-up, (b) future perceived disability and participation, and (c) chronic disability and return to work. Picavet et al (2002) found that patients with a high level of kinesiophobia had between 1.6 and 4.4 times the odds of reporting higher pain and disability at follow-up than patients with lower levels of kinesiophobia. Swinkels-Meewisse et al (2006) found that higher fear of movement/(re)injury was predictive of greater future perceived disability and lower levels of future participation. Soucy et al (2006) found that patients with higher levels of fearful beliefs about work had a

reduced likelihood of returning to work (OR = 0.38) compared with patients who reported lower levels of fearful beliefs. A further four of the 14 studies to find fear avoidance beliefs/kinesiophobia to be significantly predictive of outcome (Boersma and Linton, 2005; Dionne et al, 2007; Gheldof et al, 2007; Poiraudeau et al, 2006) also had large samples (range n = 363 to 864 at final follow-up). These studies found that fearful beliefs increased the risk of developing long-term low back pain and disability. They were also found to increase the risk of failure to recover from short-term low back pain, and failure to return to work. Odds ratios ranged from 1.0 to 4.1, showing that patients with a high level of these fearful beliefs had up to four times the odds of patients with lower fearful beliefs of having a poor clinical outcome at follow-up. The remaining studies echoed the findings of the high quality and larger studies, showing fear avoidance beliefs and/or kinesiophobia to be predictive of pain, disability, and sick leave at follow-up. One study also showed these fearful beliefs to be a multivariate independent predictor of the number of healthcare contacts during the study period (Keeley et al, 2008). These studies also showed that patients with rising levels of pain-related fear over time were more disabled at follow-up (Sieben et al, 2002).

A sensitivity analysis was then performed to assess whether study quality was associated with the prognostic indicators identified. This involved repeating the analysis of the studies following exclusion of the two studies with quality assessment scores of less than 11 (the poor quality studies). The number of studies showing a significant prognostic role of fear avoidance beliefs/kinesiophobia was reduced slightly following this analysis (significant in 13 out of 17 studies). However, this still remains the factor with the most consistent evidence for the prediction of low back pain outcome.

In summary, 14 out of 18 studies that measured fear avoidance beliefs/kinesiophobia found them to be significantly predictive of poor outcome at follow-up, with odds ratios ranging from 1.0 to 4.4. Several of these studies utilised multivariate analysis techniques. These fearful beliefs were found to predict pain, disability, sick leave and return to work, and the number of healthcare contacts over the study period. Of the studies that measured fear avoidance beliefs/kinesiophobia, three were rated as high quality. All three of these studies showed fear avoidance beliefs/kinesiophobia to be predictive of disability at follow-up. Sensitivity analysis made little difference to the overall results.

Do fear avoidance beliefs/kinesiophobia predict outcome for both acute and chronic low back pain patients?

The volume of studies measuring fear avoidance beliefs/kinesiophobia enabled the undertaking of additional analyses to investigate the relevance of these fearful beliefs as predictors of low back pain outcome in patients with acute or chronic pain at baseline. Of the 14 studies that found fear avoidance beliefs/kinesiophobia to significantly predict outcome, seven (Boersma and Linton, 2005; George et al, 2006; Klenerman et al, 1995; Poiraudeau et al, 2006; Sieben et al, 2002; Soucy et al, 2006; Swinkels-Meewisse et al, 2006) included only patients with acute/subacute pain (up to three months duration), and two (Boersma and Linton, 2006; Keeley et al, 2008) included only patients with chronic pain (more than three months duration). The first set of these studies (acute/subacute patients only) found fear avoidance beliefs/kinesiophobia to be predictive of a number of different outcomes, including pain intensity, disability, participation, sick leave and return to

work, as well as the course and persistence of low back pain. These findings show that fear avoidance beliefs/kinesiophobia are predictive of outcome for acute/subacute low back pain. The two studies (Boersma and Linton, 2006; Keeley et al, 2008) with only chronic low back pain patients found fear avoidance beliefs/kinesiophobia to be predictive of pain, disability, and the number of healthcare contacts made during the study period. This shows that these beliefs are also predictive of outcome for chronic low back pain. Further support for the role of fear avoidance beliefs/kinesiophobia in the prediction of outcome in both acute and chronic pain patients comes from the five studies (Dionne et al, 2007; Gheldof et al, 2007; Grotle et al, 2006; Kovacs et al, 2007; Picavet et al, 2002) to utilise a combination of acute and chronic patients at baseline. These studies also found fear avoidance beliefs/kinesiophobia to be predictive of a number of outcomes, including pain, disability, sick leave, and return to work. Of the four studies that found no significant predictive value of fear avoidance beliefs/kinesiophobia, two studies utilised acute/subacute pain patients (Heneweer et al, 2007; Sieben et al, 2005), one study utilised chronic pain patients (Leeuw et al, 2007), and one study utilised a combination of acute/subacute and chronic pain patients (Kovacs et al, 2005). This further demonstrates that the predictive value of fear avoidance beliefs/kinesiophobia is not dependent on the duration of patients' pain at baseline, as these fearful beliefs were predictive of a number of different outcomes in both acute and chronic low back pain patients.

Passive coping strategies

Five of the review studies investigated the role of passive coping strategies on low back pain outcome. Two of these studies did not find any significant predictive value of passive coping (Heneweer et al, 2007; Potter et al, 2000), but three studies did find passive coping to be a significant risk factor for poor low back pain outcome (Jones et al, 2006; Mercado et al, 2005; Potter and Jones, 1992). Of the studies that measured passive coping, one study (Jones et al, 2006) was rated as high quality and used a large sample size (n = 922 at follow-up). This study found that patients with a high passive coping score on the Vanderbilt Pain Management Inventory were at 50% increased risk of poor short-term outcome than patients with low passive coping scores (RR = 1.5, 95% CI = 1.1 to 2.0). Mercado et al (2005) also used a large sample size (n = 571 at final follow-up). They assessed time to the development of disabling pain and found passive coping to be an independent risk factor (i.e. predictive of the development of disabling pain after adjusting for confounding variables). People who reported a moderate level of passive coping were over five times more likely to develop disabling pain than people who reported a low level of passive coping (Hazard Rate Ratio = 5.2). People who reported a high level of passive coping were 6.8 times more likely to develop disabling pain. The remaining study (Potter and Jones, 1992) found that patients whose symptoms persisted had higher passive coping scores than patients whose symptoms resolved. However, this study presented unadjusted data on a small (n = 45) and selected sample. Therefore, the reliability of the findings is questionable. Sensitivity analysis led to the exclusion of one of the studies that did not show any significant findings for the role of passive coping

strategies in the prediction of low back pain outcome. Therefore, this slightly improved the consistency of the evidence for the role of passive coping strategies (now found to be significantly predictive of outcome in three out of four studies).

In summary, three out of five of the studies that measured passive coping strategies found them to be significantly predictive of poor outcome at follow-up. Although these studies reported strong evidence for the prognostic role of passive coping strategies, the evidence overall is inconsistent. Passive coping strategies were only measured by five studies, and not all of these studies reported significant findings. However, sensitivity analysis resulted in a slight improvement in consistency.

Depression

Nine of the review studies investigated the role of depression on low back pain outcome. Five of these studies (Boersma and Linton, 2005; Keeley et al, 2008; Neubauer et al, 2006; Potter and Jones, 1992; Reis et al, 1999) found that depression was a significant predictor of poor low back pain outcome, with poor outcome defined as either the presence of pain, higher pain intensity, the development of pain-related disability, or poorer physical health-related quality of life. Four studies did not find any significant predictive value of depression (Dionne et al, 2007; Klenerman et al, 1995; Poiraudeau et al, 2006; Sieben et al, 2005). Of the nine studies that measured depression, three studies (Boersma and Linton, 2005; Dionne et al, 2007; Poiraudeau et al, 2006) used large sample sizes (n ranged from 363 to 864 at final follow-up). However, only one of these found depression to be a significant prognostic indicator (Boersma and Linton, 2005).

They clustered subgroups of patients according to their levels of depressed mood and fear avoidance, and found that these subgroups were associated with differing low back pain outcomes. Specifically, greater levels of depression were related to the development of disability. In addition, three of the remaining studies found depression to be a strong predictor of chronicity (Neubauer et al, 2006; Potter and Jones, 1992; Reis et al, 1999), although one of these studies (Potter and Jones, 1992) presented unadjusted data on a small number of participants (n = 45) who were not consecutively selected. The studies that showed depression to be a significant prognostic indicator found that depressed patients had between 1.4 and 5.0 times the odds of developing chronic pain by follow-up. In addition, Keeley et al (2008) reported a regression model that predicted a total of 50% of the variance in physical health-related quality of life, with an R square change value of 0.31. This shows that after controlling for confounding demographic and clinical variables, the model still explained an additional 31% of the variance in physical health-related quality of life, with a significant independent contribution made by depression total scores (measured by the Hospital Anxiety and Depression Scale - HADS) ($p<0.01$). However, as the total HADS score was used, it is unclear how depression and anxiety individually contributed to this predictive value. Sensitivity analysis led to a reduced number of studies showing a significant prognostic role of depression (reduced to four out of nine studies). However the evidence for the role of depression was inconsistent, therefore this analysis only serves to highlight this inconsistency further.

In summary, five out of nine of the studies that measured depression found it to be significantly predictive of poor outcome at follow-up, with odds ratios ranging from 1.4 to 5.0. These studies showed depression to be predictive of pain,

disability, and physical health-related quality of life. However, two studies that used large samples did not show any significant findings for the role of depression in the prediction of low back pain outcome, thus highlighting the inconsistent nature of the evidence overall. Sensitivity analysis did not affect the overall results with regards to the role of depression.

Catastrophizing

Of the six studies that measured catastrophizing, three found it to be a significant predictor of low back pain outcome (Neubauer et al, 2006; Picavet et al, 2002; Severeijns et al, 2005), and three found that it did not significantly predict low back pain outcome (Leeuw et al, 2007; Sieben et al, 2005; Sieben et al, 2002). Of the studies that did find catastrophizing to significantly predict outcome, one study (Picavet et al, 2002) was rated as high quality and used a large sample size (n = 1,571 at follow-up). This study utilised the Pain Catastrophizing Scale and found that patients with a high level of catastrophizing had between 1.7 and 3.7 times the odds of reporting pain and disability at follow-up than patients with a low level of catastrophizing. A second study (Severeijns et al, 2005) with a large sample size (n = 1,888 at follow-up) found that patients with high scores on the Pain Catastrophizing Scale had 1.2 times the odds (95% CI = 1.0 to 1.4) of developing chronic pain than patients who had lower catastrophizing scores. This was echoed by the third study (Neubauer et al, 2006), which also showed the predictive role of catastrophizing. This study measured catastrophizing differently to the above studies, utilising the cognitive strategies of pain management scale (KSI). This measure is not catastrophizing-specific, as it also incorporates measurement of

several other constructs (e.g. helplessness and endurance). Patients reporting a high level of catastrophizing here had 1.2 times the odds (95% CI = 1.1 to 1.3) of reporting chronicity at follow-up than patients with a low level of catastrophizing.

In summary, only three out of the six studies that measured catastrophizing found it to be significantly predictive of chronicity (pain and disability) at follow-up, therefore the evidence for the role of catastrophizing is also inconsistent. In addition, the studies that did show significant findings reported odds ratios that, despite being statistically significant, were relatively small.

Anxiety, negative affect, and self-efficacy

Anxiety, negative affect, and self-efficacy were measured infrequently by studies to date. Anxiety was measured by three studies (Keeley et al, 2008; Poiraudeau et al, 2006; Potter and Jones, 1992), negative affect was also measured by three studies (Boersma and Linton, 2006; Gheldof et al, 2007; Sieben et al, 2005), and self-efficacy was measured by two studies (Asghari and Nicholas, 2001; Dionne et al, 2007). Although these factors were measured infrequently, some interesting results emerged.

Anxiety was found to significantly predict outcome in two out of three studies (Keeley et al, 2008; Poiraudeau et al, 2006). Poiraudeau et al (2006) found anxiety to be a determinant of persistence of back pain (OR = 2.4). This study also used a large sample size (n = 440), thus adding to the reliability of the findings. The second study (Keeley et al, 2008) showed anxiety to be independently predictive of physical health-related quality of life at follow-up. However, this study used the HADS total score, rather than individual anxiety and depression sub-scale scores,

leaving the reader unsure as to the independent contributions made (by anxiety and depression) towards this significant finding. The third study to measure anxiety (Potter and Jones, 1992) did not find it to be significantly predictive of outcome. Overall, it is difficult to draw firm conclusions about the role of anxiety in the prediction of low back pain outcome given the paucity of studies.

Negative affect was found to be significant by all three of the studies that measured it (Boersma and Linton, 2006; Gheldof et al, 2007; Sieben et al, 2005). These studies showed negative affect to be predictive of a variety of low back pain outcomes, including Graded Chronic Pain Scale scores, pain and functional disability, and the development of short-term low back pain, with one of these studies also using a large sample size (Gheldof et al, 2007). These results show consistency across a range of different outcomes and suggest that negative affect could be an important risk factor for poor low back pain outcome.

Self-efficacy was only measured by two studies, but both of these studies reported significant findings. Dionne et al (2007) used a large sample size and showed that high self-efficacy was associated with successful return to work. Asghari and Nicholas (2001) found that self-efficacy independently predicted total pain behaviour (10% of the variance) and avoidance behaviour (12% of the variance), showing that high self-efficacy beliefs were predictive of reduced avoidance behaviours. These results also consistently highlight the potentially important role of self-efficacy in the prediction of low back pain outcome. Clearly, further studies of self-efficacy are needed, however.

2.4.4. The role of behavioural coping strategies

All the studies included in this review measured coping strategies which could be deemed to be ‘cognitive’ (for example, catastrophizing, self-efficacy). However, only five out of the 29 included studies measured ‘behavioural’ coping strategies (Grotle et al, 2006; Klenerman et al, 1995; Poiraudeau et al, 2006; Potter et al, 2000; Sieben et al, 2005). Of these five studies, three only measured medication taking, and used single questions to do this (Grotle et al, 2006; Poiraudeau et al, 2006; Potter et al, 2000). The fourth study (Sieben et al, 2005) measured avoidance of physical activity, using the Physical Activity Rating Scale. The fifth study (Klenerman et al, 1995) measured a range of behavioural coping strategies: medication taking, resting, going to the doctor, and physical exercise. They used simple rating scales to measure these strategies, and they combined all behavioural coping strategies, along with the cognitive coping strategy of ‘ignoring pain’, into one variable labelled ‘coping strategies’. This ‘coping strategies’ variable was then combined with ‘stressful life events’ and ‘personality’, to create a single variable labelled ‘fear avoidance variables’. This domain of ‘fear avoidance variables’ was found to be significantly predictive of outcome at both 2 and 12 months follow-up, but it is unclear how each of the behavioural coping strategies individually contributed to this predictive value. The ‘fear avoidance variables’ label given to this group of variables appears rather imprecise, and this approach of grouping several different constructs together is less than ideal, despite the study achieving a quality assessment rating of ‘acceptable’. The four other studies that measured behavioural coping strategies did not find that they were significantly predictive of low back pain outcome.

2.4.5. Summary of results

The objective of this systematic review was to systematically identify important predictors of poor low back pain outcome in the published literature. Important prognostic indicators were examined, and the factor identified by this review that had the most consistent results was fear avoidance beliefs/kinesiophobia. This variable was measured most frequently and found to be predictive by a greater number of high quality and/or large studies. The evidence consistently showed fear avoidance beliefs/kinesiophobia to be a significant risk factor for poor low back pain outcome, with further investigation showing that these findings apply to both acute and chronic low back pain patients. Passive coping strategies, depression, and catastrophizing were also identified as risk factors for poor outcome, but the evidence for their prognostic role was inconsistent. Sensitivity analysis altered the pattern of these findings only a little and did not greatly affect the overall results. Anxiety, negative affect, and self-efficacy were also identified as possible prognostic indicators of low back pain outcome. Although being measured infrequently by the included studies, the evidence (particularly for negative affect and self-efficacy) consistently showed a predictive role. Although a cognitive-behavioural conceptualisation of coping was proposed in chapter 1 of this thesis, it was difficult to find support for this due to the limited number of behavioural coping studies identified - it was found that all 29 studies included in this review measured cognitive coping strategies, but only five studies measured behavioural coping strategies.

2.5. Discussion

The following section discusses and interprets the findings. Strengths and limitations will be discussed in relation to the included studies and the review itself, and implications for future research in this doctoral thesis and elsewhere will be presented. Some tentative implications for clinical practice will also be considered.

Despite the high degree of heterogeneity in study populations, prognostic indicators, outcomes, measurement instruments, and statistical analyses used, this review demonstrates that some of the coping strategies used by low back pain patients can significantly predict poor outcome at follow-up.

Fear avoidance beliefs/kinesiophobia

Fear avoidance beliefs/kinesiophobia were the most frequently measured of all the prognostic indicators and there was relatively consistent evidence for their role in the prediction of low back pain outcome. In particular, all of the high quality studies that measured these fearful beliefs found them to be predictive of disability at follow-up. This suggests that fear avoidance beliefs/kinesiophobia might be particularly relevant in the prediction of disability as an outcome of low back pain. This provides support for the fear avoidance model (Vlaeyen et al, 1995), which states that patients may no longer perform certain activities because they anticipate that these activities will increase pain and suffering. The model states that it is this avoidance behaviour that may lead to the ‘disuse’ syndrome, where physical deconditioning takes place, thus resulting in physical activities leading more easily to pain and physical discomfort. This in turn makes avoidance more

likely. This model clearly demonstrates the potential pathway from prognostic indicator (fear avoidance beliefs) to outcome (disability).

Another interesting finding to note was that patients with rising levels of pain-related fear over time were more disabled at follow-up (Sieben et al, 2002). This implies that there may be some sort of relationship between these fearful beliefs and disability, and one explanation might be that it is the change in pain-related fear over time that is predictive of outcome. If so, it would seem important that patients' pain-related fear be measured at more than one time point, and that in predicting outcome, the baseline score is less important than the difference between scores at each time point. For example, if the score at time 2 is similar to the baseline score, this would indicate a more favourable outcome as opposed to an increased score from baseline to time 2. This indication would remain, regardless of the actual score at baseline. This was partially supported by Sieben et al (2005), who stated that: "Those patients who do not show a spontaneous decrease of pain-related fear should be made eligible for targeted intervention" (pg. 639). No reference is made here to the absolute levels of pain-related fear reported, therefore suggesting that it could be the increase/decrease that is predictive, rather than the actual level of fear. This hypothesis was tested by Dunn and Croft (2006) amongst primary care low back pain patients. They did not find any support for the hypothesis, however this could be due to a less than ideal measurement of fear avoidance. They used a very brief (one-item) and unadjusted measure, which is potentially inadequate and could therefore impact on the study results. More research is needed in this area to further test the hypothesis.

This review also found that fearful beliefs were predictive of a number of different outcomes in both acute and chronic low back pain patients. Therefore, as the

majority of studies showed fear avoidance beliefs/kinesiophobia to be predictive of poor clinical outcome, these beliefs could be used as prognostic indicators of poor outcome for all low back pain patients, in order to help better identify patients with poor prognosis and to help inform clinical management approaches.

Passive coping strategies

This review presented evidence that high levels of passive coping were predictive of poor short-term low back pain outcome (three to six months), rather than longer-term outcomes. This could indicate that passive coping is only relevant in the prediction of short-term low back pain outcome, and that perhaps long-term studies will not find significant associations between passive coping and outcome. However, longer-term outcomes were measured infrequently by these particular studies, therefore this conclusion could simply be due to a lack of research. In addition, the two review studies that did not find any significant associations also looked at short-term outcome (up to three months). Therefore, the review studies were unable to support the hypothesis that passive coping is only predictive of short-term low back pain outcome and it is suggested that more research should be undertaken to investigate the longer-term predictive role of this particular coping factor.

Despite three studies reporting significant findings, the overall evidence for the predictive role of passive coping was inconsistent. Two of these studies presented high quality evidence and/or utilised large samples, and reported on independent effects from multivariate analyses after controlling for confounding variables. But one study presented evidence deemed to be of poor quality (despite achieving a

quality rating of ‘acceptable’) due to its use of unadjusted data and a small and selected sample. In addition, two further studies failed to find passive coping to be significantly predictive of outcome, although one of these studies was found to be poor quality here. It is clear that research regarding this particular coping factor is sparse, and more research is needed before the role of passive coping can be better understood. Passive coping could be examined further within research focusing on control beliefs, or more specifically, on Locus of Control (LoC). LoC is underpinned by self-efficacy beliefs, as it relates to the control people believe that they have over events or outcomes. As with self-efficacy, it is the perception of control that is as important as the actual control that the individual possesses. It is widely believed that chronic pain patients who endorse an internal LoC generally use more active coping strategies, resulting in better functioning and more positive outcomes (LaChapelle et al, 2001). Therefore, the link between external LoC, low self-efficacy, and a passive coping style should be given more research attention, as new studies could potentially identify pathways for changing patients’ passive coping styles through the modification of self-efficacy and control beliefs, or vice versa.

Depression

Depression was shown to be predictive of the development of chronic low back pain and disability, as well as physical health-related quality of life. However, the overall evidence was inconsistent. More than half of the studies that investigated the prognostic role of depression either did not report any significant findings, or were rated here as being poor quality studies. For example, Boersma and Linton

(2005) showed a significant association between depression and pain-related disability at 12 months follow-up, but they combined depression with fear avoidance when grouping patients. Therefore it is unclear whether depression or fear avoidance is accountable for this association and, if it is a combination of the two, what is the extent to which each aspect is predicting low back pain outcome. Sensitivity analysis led to the removal of this study based on poor quality scores, although this did not affect the overall results. It simply highlighted the inconsistencies in the evidence. Depression has been consistently shown to be predictive of poor outcomes in a range of different health conditions, from heart disease and surgery to end-stage renal disease (Karlsson et al, 2008; Son et al, 2009). However, the findings from this review (in relation to depression as a predictor of poor low back pain outcome) are inconclusive, with the review revealing inconsistencies in the evidence for the role of depression. This contradicts the findings of a similar systematic review conducted by Pincus et al (2002), which reported that depression resulted in an increased risk of chronicity. The differences between the findings of these two systematic reviews could be explained by the stringent inclusion criteria used and the subsequent small number of studies that were reviewed by Pincus et al (2002). The current review therefore provides a more comprehensive assessment of the current literature and thus more reliable findings. The inconsistencies reported here could potentially be due to the considerable heterogeneity amongst the included studies. For example, the nine studies that measured depression used a total of eight different measurement instruments to do so. This could potentially affect the consistency of the results. Son et al (2009) called for further research to understand the causal relationship between depression and health outcomes. This is needed in relation

to low back pain, in order to clarify the results of this review and identify whether depression is a strong predictor of outcome.

Catastrophizing

It was interesting to note that five out of the six studies that measured catastrophizing used the Pain Catastrophizing Scale to do so. However, the study that used an alternative measure reported comparable results, and actually replicated the findings of one of the studies that used the Pain Catastrophizing Scale (Severeijns et al, 2005). This indicates that results appear not to differ greatly according to the measurement instrument used to assess patients' pain catastrophizing.

Catastrophizing was found to be a significant risk factor for increased pain and disability, as well as for the development of chronicity. However, the number of studies showing a significant effect of catastrophizing was relatively low (three out of six studies), and the reported odds ratios were relatively small. Therefore, it is questionable as to whether these results are particularly meaningful. Vlaeyen et al (1995) reported that further research is needed to clarify the theoretical and clinical role of catastrophizing, and this is evidently still the case today. With only half of the studies that measured catastrophizing reporting significant findings, the evidence is clearly inconsistent and must be interpreted with caution until further research in the area is conducted. However it is worth noting that the studies showing catastrophizing to be significantly predictive of low back pain outcome utilised much larger samples than those showing no predictive effects (n = 192 to 1,888 versus n = 30 to 171), therefore these studies should be more reliable due

to their smaller confidence intervals and the subsequent precision of their estimates of prediction. This would support the findings of several other studies in the area that have identified catastrophizing as a significant predictor of outcome in a variety of pain conditions, such as spinal cord injury and rheumatic diseases (e.g. arthritis, fibromyalgia) (Edwards et al, 2006; Turner et al, 2002).

Anxiety, negative affect, and self-efficacy

This review also identified anxiety, negative affect, and self-efficacy as potential prognostic factors, but the evidence for their role was limited due to the small number of studies that measured these factors. However, despite being measured by only a few studies, the evidence for the prognostic role of negative affect and self-efficacy was consistent, with all studies reporting significant findings. The evidence for the prognostic role of anxiety was also quite consistent, with two out of three studies reporting significant findings. It is again interesting to note that the study showing no significant findings (Potter and Jones, 1992) utilised only a small sample (n = 45) and therefore the results of this study could be regarded as less reliable than those of the two studies showing significant findings (Keeley et al, 2008; Poiraudeau et al, 2006). The consistency of the evidence here would support the findings of other studies that have demonstrated the predictive role of these three variables across a variety of pain conditions, such as rheumatoid arthritis, fibromyalgia, and chronic musculoskeletal pain of the low back, hip, or knee (Bair et al, 2008; Buckelew et al, 1996; Potter et al, 2000; Strahl et al, 2000). However, despite these promising results, the lack of studies measuring these

factors highlights the need for caution in interpreting the findings here and identifies the need for future research.

Behavioural coping strategies

The measurement of behavioural coping was limited. Only five studies measured behavioural coping strategies, and three of these used only a single question to do so (Grotle et al, 2006; Poiraudeau et al, 2006; Potter et al, 2000). This shows that behavioural coping has been consistently neglected in favour of research investigating cognitive coping strategies. The only study to show any significant predictive value of behavioural coping (Klenerman et al, 1995) is difficult to interpret, due to a lack of clarity in the measurement of prognostic factors. By combining several coping factors, information is lost regarding the individual significance of these factors and the study's results are difficult to interpret. This is a methodological flaw of the Klenerman et al (1995) study, highlighting that even when behavioural coping strategies are measured, the quality of this research is often less than optimal. It is therefore important that researchers address these issues, giving increased attention to the ways in which behavioural coping is measured, as well as to the quality of this measurement. This increase in attention was also called for by van Lankveld et al (1999), although researchers have so far failed to address this. It is possible that problems surrounding the definition and assessment of behavioural coping strategies, identified by Keefe et al (1992), could be responsible for researchers' reluctance to tackle this under-researched area. It is possible that this lack of behavioural coping research is a result of the fact that behavioural coping is more difficult to assess than cognitive coping. For

example, there is the issue of self-report measures versus observation of actual behaviour. The latter is difficult to conduct and can be time consuming, however the former can be unreliable and potentially be influenced by context (e.g. patients consulting for treatment or for social security assessment may report differently to other low back pain patients). It is also possible that this lack of behavioural coping research is a result of the fact that no standardised measure of behavioural coping currently exists for use within this population. This lack of a measurement instrument could be a result of the difficulty in including and categorising all coping behaviours used by patients. This process requires careful observational work, which may be complex and time consuming. In addition, it could be due to difficulties faced when trying to distinguish behavioural coping from outcome. For example, whether 'lying down' is a behavioural coping strategy or a marker of outcome (disability). Nevertheless, the paucity in this area highlights the development of such a measure as particularly important in the field and future research should prioritise this development to enable the investigation of the prognostic role of behavioural, as well as cognitive, coping strategies.

2.5.1. Strengths and limitations of the included studies

One strength of the included studies was that most of the quality criteria were met by a vast majority of the studies. For example, all 29 studies provided information about measurement instruments used, and all studies assessed their prognostic variable(s) and outcome(s) appropriately. Twenty-eight studies used statistical analysis that was appropriate and described (e.g. analysis showing the prediction of outcome over time with a clear enough description of what was done to enable

replication), and 19 studies comprehensively reported the main results and discussed study limitations. The vast majority of studies (n = 25) adjusted for potential confounders using approaches such as multivariate regression analysis. This is indicative of the robustness of the included studies, with only four studies failing to adjust for other known factors. However, of these four studies, only one was rated as poor quality. The remaining three studies were rated as being of acceptable quality (quality ratings of 11, 12, and 13), indicating a potential limitation with regards to the use of overall quality ratings in this review. This will be discussed in section 2.5.2 below.

Across the 29 included studies, many coping factors were investigated. However, one potential limitation is that the quality of measurement of the predictive variables differed greatly across the studies, with several studies using only single questions to measure these variables, a common approach in large epidemiological cohorts. This could impact on the study results and should therefore be taken into consideration when attempting to interpret study findings. A further potential limitation is that each individual study only focused on a small number of predictive variables, therefore the studies were not comprehensive in their examination of how coping predicts low back pain outcome. The number of predictive coping variables investigated ranged from only one to a maximum of five, with only one study investigating five different coping factors, but 11 studies investigating only one factor. The median number of factors investigated was two, further demonstrating the narrow focus of the included studies. Unless a broad range of prognostic factors are included, the relative importance of the different coping factors in each study sample cannot be determined. The relative importance of the coping strategies should be examined in order to identify

independent predictors of low back pain outcome and the relative strength of these predictors. The limited range of factors studied, however, does not reflect the quality of the studies. Studies investigating only a single variable may still be of a high quality, even though they do not provide a comprehensive examination of how coping predicts low back pain outcome, and cannot identify the most predictive factors. This is an important issue, highlighting the need for quality assessment and the importance of examining the individual quality criteria met by a study (rather than the overall quality score), in order to make an informed judgement about the quality of measurement of the prognostic factors.

2.5.2. Strengths and limitations of this review

One strength of this review was the comprehensive search strategy used to locate relevant studies. This search strategy was adjusted for each different electronic database used, and was therefore specific in its searching of a wide variety of information sources. Some studies were not identified through the search terms. This was mainly because the electronic search terms required the study setting to be coded in order for the study to be picked up. Several studies did not include the setting within their list of key words, therefore these were missed by the electronic search terms. However, these studies were ultimately identified through the comprehensive search strategy, providing an indication of the effectiveness of the systematic search.

In addition, another strength of this review was the large number of studies that were identified through the systematic search. These study abstracts were all screened by the researcher, thus providing a comprehensive collection of relevant

studies and a complete picture of previous findings. The quality assessment checklist can also be regarded as a strength of this review. The checklist used (based on the work of Hayden et al[1]) was refined and elaborated specifically for this review, making it more applicable to the specific review question and therefore increasing its validity as a quality assessment measure in this review. It also enabled the undertaking of a sensitivity analysis, based on the overall quality ratings. This was another strength of the review, highlighting the previously outlined inconsistencies in the evidence with regards to the role of depression as a predictor of outcome.

One potential limitation of this review is the use of an overall quality assessment score with equal weighting given to each of the 17 quality assessment criteria. The use of such tools is controversial, and the assumption behind equal weighting of checklists is questionable (Mallen et al, 2007). This is due to the fact that studies are still able to achieve a high quality rating, even if they are seriously flawed in one important aspect (e.g. data analysis), thus achieving the same overall rating as good quality studies that fail only a minor aspect of quality assessment. In an effort to compensate for this, tables of the individual criteria met by each study are presented in the review. This should allow the reader to view the quality rating of the included studies, along with details of how these ratings were achieved.

In relation to the quality assessment criteria, another potential limitation of this review could be the amendments made to the Hayden et al[1] criteria. Two new criteria were added to the original list, however one of these criteria was met by most of the included studies (n = 20), whereas the other criterion was only met by two studies. The problem with these criteria is that they do not add a lot (in terms

[1] Personal communication from K M Dunn (March 2008)

of distinguishing between the levels of quality of the studies) to the overall quality assessment. However, they do provide a useful guide for the undertaking of future research. By referring and adhering to the criteria, future studies carried out by the researcher could be improved in terms of their overall quality by ensuring that not only commonly met criteria are addressed, but also criteria often overlooked by other researchers in the field. Dissemination of the findings reported within this chapter (including the quality assessment criteria) would also enable other researchers in the field to improve the quality of their studies.

Limitations of the quality assessment checklist may also extend to the cut-off points used for overall quality ratings. The vast majority of included studies (n = 23) were rated as ‘acceptable’ quality, with only four studies rated ‘high’ quality and only two studies rated ‘poor’ quality. Therefore, the cut-off points used did not effectively distinguish between the studies in terms of the variety of quality ratings achieved. However, these quality rating cut-off points were established from previous reviews and were thought to replicate a similar assessment system. It is possible that the study designs selected for the review might be responsible for the unilateral quality ratings observed (i.e. prospective longitudinal studies are less likely than other study designs to be of poor quality).

The lack of poor quality studies might also reflect the presence of publication bias or the underreporting of non-significant findings in published studies (Dubben and Beck-Bornholdt, 2005). This would result in an overestimation of the prognostic value of the factors identified in this review. For example, if several studies found no significant association between a particular coping-related factor and outcome, the failure to report or publish these findings would result in the literature appearing to suggest that the majority of study findings were significant.

Although it is impossible to accurately predict the extent of this potential overestimation and its impact on this review, it is important that the reader is aware of this possibility when interpreting the results here.

A second potential limitation was identified upon re-examination of the search strategy. It could be argued that the search strategy is weighted in favour of cognitive coping. It was initially thought that several non-specific terms (e.g. 'coping', 'behavio*', 'adaptation' etc.) would identify behavioural coping. However, the lack of a standardised measure could mean that many behavioural coping strategies are not categorised specifically as 'behavioural coping strategies'. They may be coded more specifically (e.g. 'medication taking', 'exercise' etc.), and therefore missed by the search terms. This could explain the lack of identified studies measuring behavioural coping, and highlights the problem of the reported results simply being an artefact of selection. It is important to consider these limitations when searching for behavioural coping studies in future. A more specific search of behavioural coping strategies would be relatively easy to perform and could provide a more comprehensive examination of behavioural coping and its role in the prediction of low back pain outcome.

2.5.3. Implications

Clinical practice

The coping strategies identified in this review as prognostic indicators of poor low back pain outcome have clinical relevance given that all are potentially modifiable (i.e. they are amenable to change) (Currie and Wang, 2005; van der Windt et al,

2008). This was demonstrated by Moore et al (2000), who conducted a primary care randomised trial of a self-care intervention and found that the intervention program successfully benefited patients in terms of reducing their fear avoidance beliefs. In addition, Vlaeyen and Crombez (1999) suggested that patients' pain-related fear can be influenced by factors such as the practitioner-patient interaction, and Morley and Keefe (2007) commented that a recent study (Turner et al, 2007) provided: "substantive evidence that changes in key cognitive variables targeted in the cognitive behavioural therapy (CBT) protocols (in particular changes in self-efficacy and perceived control over pain) are associated with improvements in pain and disability outcomes at 1 year post treatment" (pg. 197). They also stated that: "A major focus of CBT is on changing coping skills and improvements in an array of coping skills have been noted in other CBT studies" (pg. 197). Therefore, there is potential for clinical interventions to modify the coping strategies identified here. Reid et al (2002) stated that modifiable factors represent appropriate targets for intervention, and van der Windt et al (2008) stated that modification of these factors might be effective in reducing or preventing chronic or recurrent disability. However, Morley and Keefe (2007) also stated that it is unknown at present what actually initiates this change/modification. Therefore, by determining the role of these specific coping strategies in the prediction of low back pain outcome, this review has identified important and potentially modifiable variables for future research. If these variables are to be of any clinical utility, further research must examine their potential for modification and the mechanisms behind this change, to enable them to be targeted by pain management interventions in order to improve low back pain and related disability.

Future research

This review highlights that no single indicator of coping can be used exclusively to predict poor low back pain outcome. It is possible that a range of factors might be more useful, however none of the included studies examined a wide range of factors, and therefore this is one hypothesis that could be explored through future research. Fear avoidance beliefs/kinesiophobia appeared to be the most predictive factor from available published studies, with limited but promising evidence for the role of anxiety, negative affect, and self-efficacy. It also reported inconsistent evidence for the role of passive coping strategies, depression, and catastrophizing as predictors of low back pain outcome. Although a large number of studies were identified, not all of the studies measured the prognostic indicators identified. Several prognostic indicators were only measured by a few studies (e.g. passive coping strategies were only measured by five studies) and therefore future research must investigate these factors further, in order to build up the pool of research on these specific coping factors and develop a clearer picture of their role in the prediction of low back pain outcome. Research assessing the role of behavioural coping was particularly limited, which is possibly due to the lack of a standardised measure of behavioural coping. This should be prioritised by researchers and there is a clear need to develop a standardised and valid measure of behavioural coping, to encourage future research focus and increase the volume of published papers in this area. The development of a measurement instrument of this kind will help to explore the coping paradigm in more detail, giving focus to behavioural as well as cognitive coping strategies. This could bring benefits to the field and, along with further research looking at the relative strength

of different predictive factors, could enable the formation of theoretical models for the prediction of low back pain outcome through the provision of potential causal pathways. For example, Vlaeyen et al (1995) described a fear avoidance model, where fearful beliefs led to avoidance behaviour, which in turn led to disuse and chronicity. In addition, DeGood and Tait (2001) described catastrophizing as a potential moderator (i.e. a variable that affects the direction and/or strength of the relationship between a predictor and an outcome variable – Baron and Kenny, 1986) of the relationship between pain-related coping and adjustment. Geisser et al (1999) also argued that catastrophizing could be a moderator, affecting the likelihood of coping adaptively with pain. Further research could attempt to shed some light on the role of catastrophizing by investigating this possibility.

Researchers should aim to conduct and report high quality studies, in order to contribute the most valuable research possible to the field. The quality assessment checklist developed for this review could be used for reference when conducting and reporting studies, and should help to increase the overall standard of research in this area. High quality research is needed to provide support for the suggestions made here and to overcome certain problems identified, such as the unreliability of depression as a prognostic indicator (in part, due to poor quality studies). Further research is needed to clarify the role of depression in the prediction of low back pain outcome (Son et al, 2009) and to investigate its utility as a prognostic indicator (i.e. a predictor of outcome) or a potential mediator (i.e. a variable that accounts for the relationship between a predictor and an outcome variable – Baron and Kenny, 1986). For example, it is possible that depression is merely often associated with another prognostic indicator, rather than actually influencing outcome itself. This could explain the inconclusive results reported here and

further highlights the need for more high quality research into the role of depression in low back pain. Future reviews must be conducted to collate research findings and to enhance knowledge of coping factors that can predict poor outcome. These can build on the findings of the current review, by adding to the pool of studies used, and updating the results accordingly. However, more research studies are needed to clarify the role of the coping strategies identified in this review. Specific hypotheses identified by the review should form the basis of future research studies (e.g. it was hypothesized that passive coping is only relevant in the prediction of short-term low back pain outcome). Intervention studies have already shown that modification of these coping factors can be associated with outcome. For example, Woby et al (2004) studied a group of chronic low back pain patients receiving a cognitive-behavioural informed, physiotherapist-led intervention, and found that reductions in fear avoidance beliefs were uniquely related to reductions in disability, even after controlling for reductions in pain intensity. This finding is encouraging, but more intervention studies are needed to further investigate the clinical utility of the potential prognostic indicators identified in this review, as only fear avoidance beliefs have been studied relatively frequently. In addition, such studies could investigate whether any additional benefits exist when other factors (i.e. those not measured by the included studies) are also targeted.

This systematic review has highlighted several avenues for exploration within this thesis. Firstly, it has highlighted important prognostic indicators of poor low back pain outcome for this thesis to focus on. These prognostic indicators can now be examined further within the thesis, in order to determine which of these factors independently predict low back pain outcome and the relative strength of these

predictors (see Chapter 7). Secondly, this review has highlighted the need for more research into the impact of behavioural coping, including the future development of a standardised measure. This thesis will attempt to address this need by further investigating the measurement of behavioural coping in order to develop the first measure of behavioural coping activities in this field (see Chapter 4). Finally, this review has revealed a further avenue for exploration within the thesis, with regard to theoretical models of coping. Despite previous suggestions (e.g. Vlaeyen et al, 1995), such theoretical models are sparse at present and are by no means comprehensive. Their development could help to clarify the predictive pathways that lead some low back pain patients to become chronic pain sufferers. This thesis therefore includes an attempt to identify a coping model that can be taken forward and utilised by other researchers in the field (see Chapter 9).

The following chapter (see Chapter 3) provides information on the baseline characteristics of the BeBack sample and compares these to characteristics of other primary care low back pain cohorts.

3. Descriptive statistics – baseline characteristics of the BeBack cohort

This chapter aims to describe the cohort of low back pain patients in the BeBack study whose data were used for all further analyses throughout the PhD. The sample demographics will be described, along with the clinical characteristics (both physical and psychological) and the coping strategy use across the sample. Sample characteristics will be progressively compared with those of other samples, to explore the degree of similarity between this and other primary care low back pain cohorts.

3.1. Distributional statistics

This section presents an explanation of the main distributional statistics used to describe the sample in this chapter.

Mean, Median and Standard Deviation

The mean and median are both used frequently to describe average or typical values (Jordan et al, 1998). The mean is the sum of all the values divided by the number of values. The median is the middle value (half-way), when all values are ranked in order from smallest to largest. The standard deviation (SD) averages the distance each value is from the mean and thus provides some information about the way values are distributed (Jordan et al, 1998). Usually, about 95% of a set of values will lie within two SDs of the mean, so the SD tells us about the amount of

variability in a set of values. The percentage within three points of the mean is also used within this chapter, in order to describe the distribution of the values.

Percentiles, Quartiles and Inter-Quartile Range

Percentiles convey the percentage of cases that lie above or below them (Jordan et al, 1998). For example, 25% of cases will have values below the 25th percentile, and 75% above. The 25th, 50th (median), and 75th percentiles are referred to as quartiles, because they divide the sample into four groups (Field, 2009). Percentiles and quartiles attempt to quantify the spread of a set of values (Field, 2009; Jordan et al, 1998). The inter-quartile range (IQR) can be calculated by looking at the difference between the 25th and 75th percentiles (Jordan et al, 1998). For example, if the 25th percentile is 6 and the 75th percentile is 25, the IQR will be 19 (the difference between the two). The IQR is useful because it is not easily affected by extreme values or outliers (Field, 2009). It reflects where exactly half of the values lie, thus revealing further information about the spread of a set of values.

Skewness and Kurtosis

Skewness and kurtosis values are used to assess the normality of variables (Field, 2009). Skewness provides an indication of the symmetry of the distribution (where a skewed variable is one whose mean is not in the centre of the distribution), and kurtosis provides information about the peakedness of the distribution (where non-normal kurtosis produces an underestimate of the variance of a variable) (Pallant,

2007). With a perfectly normal distribution, skewness and kurtosis values would equal zero. Positive skewness indicates a clustering of lower values, and negative skewness indicates a clustering of higher values (Pallant, 2007). Positive kurtosis indicates that the distribution is peaked (clustered in the centre), and negative kurtosis indicates that the distribution is flat (with too many cases in the extremes) (Pallant, 2007). The problems associated with skewness and kurtosis are important to consider, however Tabachnick and Fidell (2007) stated that, with reasonably large sample sizes, the risks associated with skewness and kurtosis are reduced. They reported that these problems should not make a substantive difference in the analysis, because the variable often does not deviate enough from normality. They suggested that samples with over 200 cases should be adequate, therefore the effects of skewness and kurtosis in the BeBack sample should be minimal, because the sample size (n = 1,591 at baseline) far exceeds the suggested figure. However, skewness and kurtosis values will be presented here, as part of the data exploration and to add to the analysis of the histograms shown (as suggested by Tabachnick and Fidell, 2007).

3.2. Loss to follow-up and potential non-response bias

There was quite a considerable loss to follow-up over the study period, with only 473 responses received to the 12 month questionnaire. Therefore, 1,118 baseline responders did not complete the 12 month questionnaire and therefore did not contribute to the outcome data.

The responders to the 12 month questionnaire were, on average, older than the non-responders (mean age 46.2 versus 42.9 years) and more likely to be female

(61% versus 57%). They were also more likely to be employed (77% versus 73%) and to belong to the highest SES group (34% versus 25%). They appeared to consult earlier in the course of their back pain problem, with 41% reporting a duration of less than one month compared to 34% of non-responders.

Despite the demographic differences between responders and non-responders, baseline pain intensity and disability scores did not differ significantly between the groups. Therefore although the results may be affected to an extent due to demographic bias in responders versus non-responders at 12 months, the baseline clinical characteristics of these patients were not significantly different and it can therefore be assumed that the effects of response bias here were minimal.

3.3. Sample demographics

A summary of the baseline BeBack sample demographic characteristics are presented in table 3.1 (see Appendix 1, pg. 380 for the demographic section of the baseline BeBack questionnaire). Participants were aged between 18 and 60 years, with a mean age of 44 years (SD = 10). The negative skewness value (-0.442) indicates a clustering of older participants in the sample. This is further indicated by the negative kurtosis value (-0.564), showing that the distribution of age in the sample is relatively flat, with too many cases in the extremes. Figure 3.1 shows that this clustering occurred at the higher end of the age range, as would be expected for a primary care sample of low back pain consulters. Studies have shown that low back pain is more common in middle aged adults than younger adults. For example, Croft et al (1998) reported their highest consultation rates

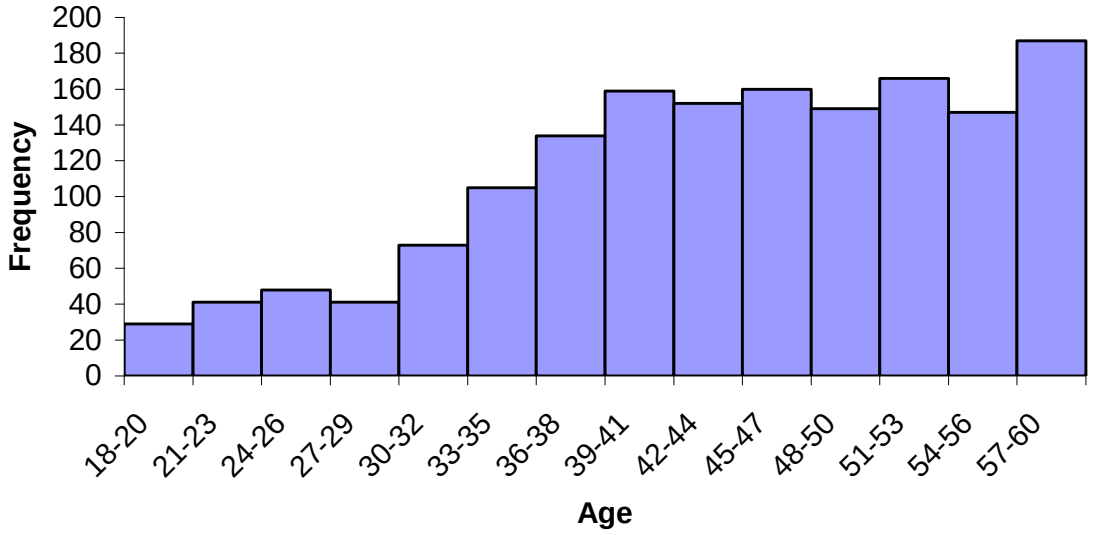
Table 3.1: Baseline BeBack sample demographic characteristics

Variables	N (%) / Mean (SD)
Age	43.9 (10.3)
Females	930 (58.5%)
SES*: Higher professional/manager	140 (8.8%)
Lower professional/manager	302 (18.9%)
Inter occupations	251 (15.8%)
Self-employed	73 (4.6%)
Lower sup/tech	76 (4.8%)
Semi-routine	318 (20.0%)
Routine	236 (14.8%)
Missing	195 (12.3%)
Employed	1,177 (74.0%)
Sick leave in last 6 months: No time	489 (41.4%)
<7 days	295 (25.0%)
1 – 4 weeks	275 (23.3%)
> 1 month	81 (6.9%)
> 3 months	41 (3.5%)
Job satisfaction: Very satisfied	356 (30.1%)
Satisfied	484 (40.9%)
Neither	193 (16.3%)
Dissatisfied	116 (9.8%)
Very dissatisfied	33 (2.8%)
Unemployed	391 (24.6%)
Reason for unemployment:	
Low back pain	132 (34.8%)
Looking after home/children	96 (25.3%)
Retired	41 (10.8%)
Student	13 (3.4%)
Other reason	97 (25.6%)

*SES = Socio-economic status

amongst patients aged 45 to 59 years, and Coste et al (1994) reported a mean age of 46.5 (SD = 14.3), thus closely resembling the data reported here. It is worth noting that due to the use of a large sample size here, the associated risks of skewness and kurtosis will be reduced and should not substantially influence the results (Tabachnick and Fidell, 2007).

Figure 3.1: Distribution of age among baseline responders



The sample consisted of 930 females (58.5%) and 661 males (41.5%). Socio-economic status (SES) could not be determined for 12% of the sample due to missing data, but from the responses of those participants whose SES could be determined (n = 1,395), variability appeared to be high. The classifications (ONS, 2002; ONS, 2000) that encompassed the highest number of participants were 'semi-routine' (20%), and 'lower professional/manager' (18.9%). The majority of participants were employed (74%), with 24.6% stating that they were not employed. The most common reason for unemployment was low back pain – 34.8% of those who were not working reported this to be due to low back pain. Therefore, approximately 8% of the whole population of low back pain consulters (approximately 1 in 12) were unemployed as a result of their low back pain, indicating the disabling effects of this condition for many sufferers. Other common reasons for unemployment included looking after the home/children (25.3%), retirement (10.8%), and 'other reason' (25.6%). Of those who were employed (n = 1,177), 41.4% of participants had taken no time off work due to low back pain in

the last 6 months, 25% had taken less than 7 days off work in the last 6 months, and 23.3% had taken 1 to 4 weeks off. In addition, job satisfaction was high across the sample, with only 12.6% of employed participants reporting that they were either ‘dissatisfied’ or ‘very dissatisfied’ with their employment.

3.4. Clinical characteristics

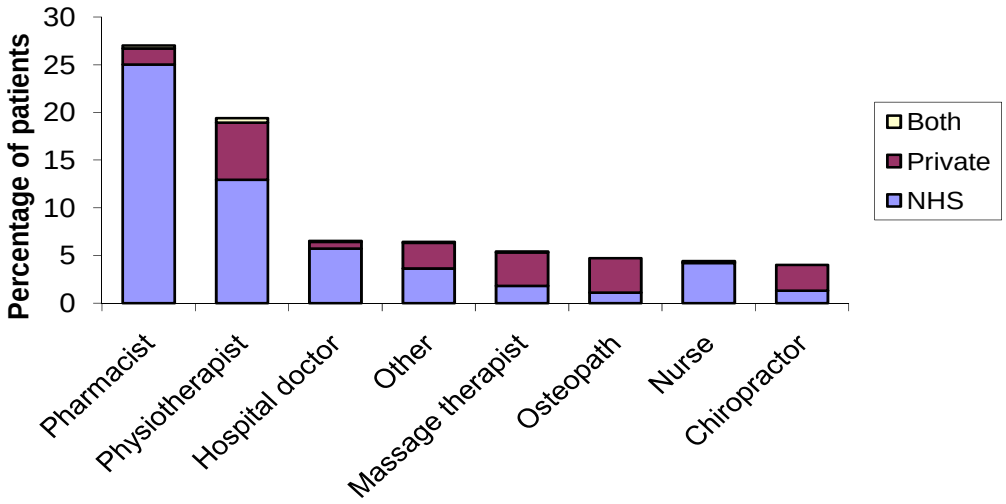
The various treatment services used by patients in the sample were reported for the previous four weeks (see Appendix 1, pg. 368 for this section of the BeBack questionnaire). All patients aged 18 to 60 years who consulted in primary care with low back pain during the study period were identified as potential participants for the study. It was expected that the vast majority of these consultations would have been with a GP, with a small number accessing primary care services through triage or practice nurses. In total, 82.7% of patients reported accessing their GP, with 17.3% of patients possibly accessing primary care through other avenues. For example, several patients may have seen or spoken to (via telephone) a practice nurse instead of a GP. This percentage is higher than expected and there could be several explanations for this. Firstly, it is possible that patients had forgotten exactly when their GP consultation took place and estimated inaccurately, however it is also possible that inaccurate read codes were used to classify the nature of some patient consultations. But this should have occurred infrequently, therefore only accounting for a small number of incorrectly identified patients. An example of a coding error would be if patients did consult their GP about back pain, but this was not their main reason for consulting (i.e. back pain was mentioned whilst consulting for something else). Alternatively, it could simply be

because some patients did not complete and return the questionnaire within four weeks of their consultation.

The percentages of patients reporting using other treatment services are shown in figure 3.2. This shows the percentage of patients who used NHS services only, the percentage of patients who used private services only, and the percentage of patients who used both NHS and private services. Amongst these other treatment services, NHS pharmacists and physiotherapists were the most frequently accessed (25.3% and 13.4% of patients, respectively). The higher use of NHS pharmacists and physiotherapists is to be expected amongst this sample of primary care consulters because these services are more easily accessed and are often the most appropriate for patients with an acute low back pain problem. Other NHS services (nurse, hospital doctor, osteopath, chiropractor, massage therapist, and 'other') were only used by small numbers of patients (between 1.1% and 5.8%). Private services were also only accessed by small numbers of patients (between 0.2% and 6.5%). Overall, the percentages of patients using other various treatment services were low. However, this may simply reflect the timing of the baseline questionnaire. As most patients consulted for low back pain within the previous four weeks, they did not have a lot of time to utilise other treatment services. Even if they had attempted to access these services, they could have been put onto a waiting list and therefore not yet used the particular service. Even a one- to two-week waiting list could have affected the numbers of patients due to the timing of the questionnaire. In addition, many of these services would not be appropriate for the majority of these patients. For example, most patients are unlikely to need a referral to a hospital doctor after a primary care consultation for low back pain. Patients would also be less likely to pay for private services at this

stage. It is expected that this willingness to pay for private services will increase with increased pain duration and disability.

Figure 3.2: The percentage of patients using NHS only, private only, or both NHS and private treatment services



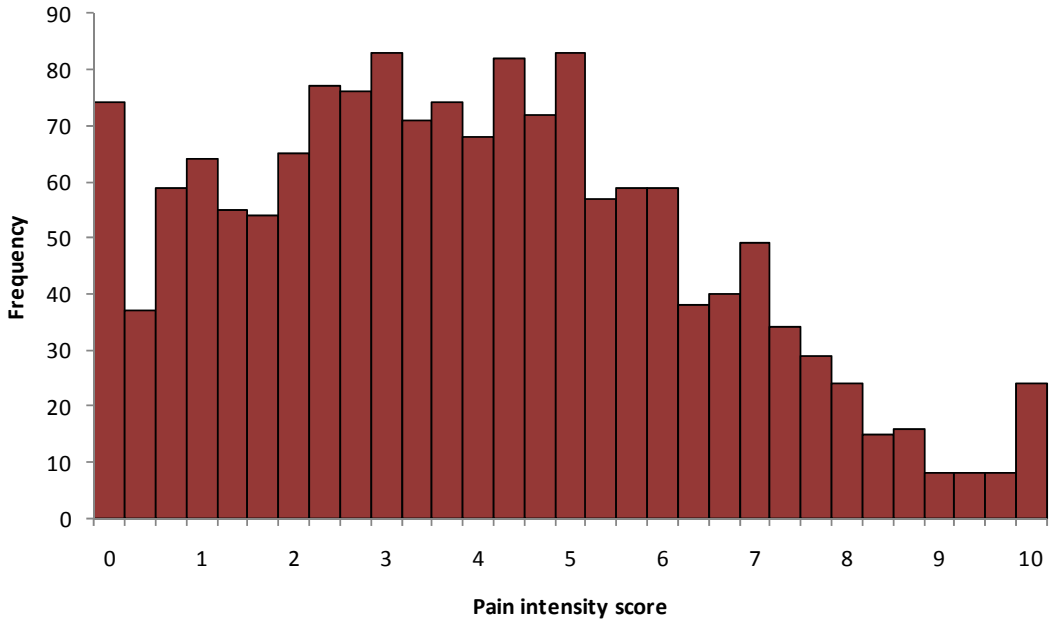
Low back pain is often classified as either acute (less than three months duration and usually thought of as related to, and in proportion with, tissue damage) or chronic (more than three months duration) (Merskey and Bogduk, 1994), reflecting the widely used International Association for the Study of Pain (IASP) definition of chronic pain: “Pain without apparent biological value that has persisted beyond normal tissue healing time (usually taken to be three months)” (IASP: Pain Clinical Updates, 2003). Approximately two thirds of the sample (64.3%) were suffering from an episode of acute pain (up to three months duration). However, when patients were asked how long it had been since they had a whole month without any back pain, 15.3% reported that it had been 4 to 6 months, 21.8% reported that it had been 7 months to 3 years, and 21.2% reported that it had been more than 3 years. Therefore, a high percentage of the sample (58.3%) had experienced

recurrent bouts of pain over several months or years. This is as would be expected (Dunn and Croft, 2004; Von Korff and Saunders, 1996).

Pain intensity scores were calculated from the mean score of patient ratings of least pain, usual pain, and current pain levels (as in Dunn et al, 2006). Each of these original pain scores were rated using a numeric rating scale that ranged from 0 to 10, with higher scores indicating greater pain intensity (see Appendix 1, pg. 361 and pg. 366). Therefore, the overall pain intensity score also ranged from 0 to 10 (mean = 3.94, SD = 2.43). As this is a novel way of assessing pain intensity, it is not possible to make direct comparisons with other primary care cohorts. Figure 3.3 highlights the variability of pain intensity scores across the sample at baseline, but it also shows that few patients reported severe pain problems (e.g. scores of 8 and above), and that greater numbers of patients scored towards the lower end of the scale (e.g. scores of 0 to 5). This tendency towards lower pain intensity scores is reflected in the mean score (3.94) and is to be expected within a primary care sample of low back pain patients, with previous studies of primary care patients reporting mean baseline pain intensity scores of between 4.8 and 6.0 (Denison et al, 2004; Von Korff et al, 1998). Figure 3.3 also shows that several patients (n = 74) reported a pain intensity score of 0. It is likely that these patients were presenting in primary care with a first/new episode of acute pain and that by the time they completed the baseline questionnaire (within four weeks of their consultation), they had recovered from their episode of pain.

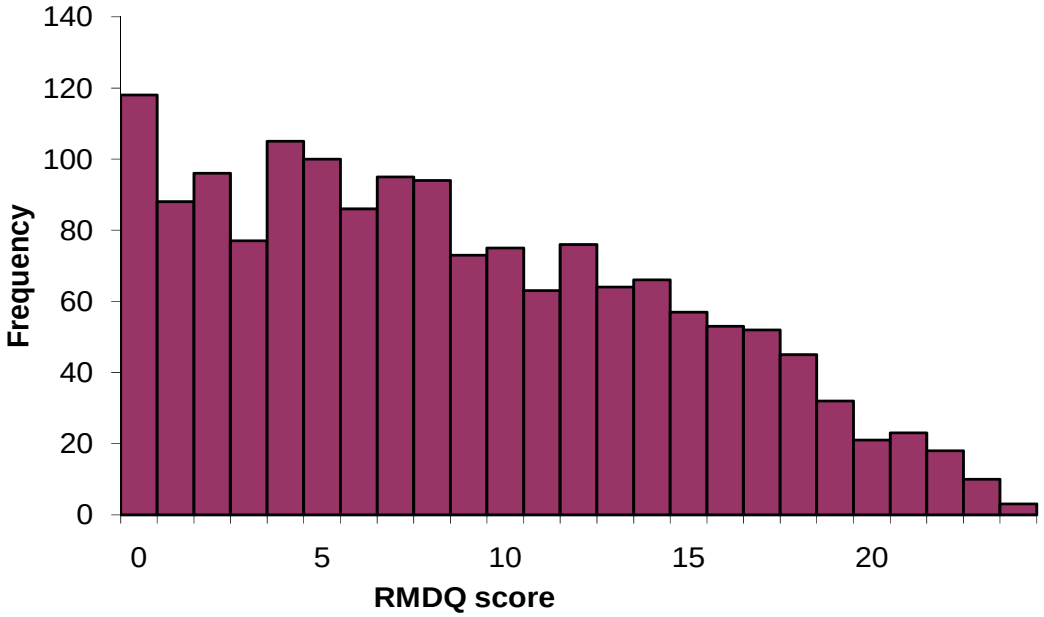
Disability scores on the Roland-Morris Disability Questionnaire (RMDQ) (Roland and Morris, 1983) ranged from 0 to 24 (where 24 is the maximum back-specific disability), with a mean score of 8.64 (SD = 6.04) (see Appendix 1, pg. 365 for the RMDQ). This mean score demonstrates the similarities between the study sample

Figure 3.3: Range of pain intensity scores among baseline responders



and other primary care cohorts, as several primary care studies have reported mean baseline RMDQ scores of between 8.0 and 9.7 (Brealey et al, 2003; Burton et al, 1999; Jordan et al, 2006; Kendrick et al, 2001; Von Korff et al, 1998). The histogram of RMDQ scores (see figure 3.4) shows a clustering of scores around this point and higher scores obtained by far fewer patients, which is as expected for a cohort of primary care low back pain patients. The histogram also shows that a number of patients reported very low baseline RMDQ scores (over 7% of patients scored 0 on the scale). This is normal within a primary care sample of patients, as most patients within primary care would be suffering from an acute episode of pain where related disability is minimal (see Chapter 1). Additionally, as questionnaires were completed between one and four weeks post-consultation, many patients may have recovered substantially over this period and thus their reporting of functional limitations in the past 24 hours would be low.

Figure 3.4: Range of RMDQ scores among baseline responders



3.5. Coping strategies

3.5.1. The Hospital Anxiety and Depression Scale

The Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith, 1983) is a 14-item instrument, designed to measure symptoms of anxiety and depression in people with physical illness (7 items for anxiety and 7 items for depression). Respondents are asked to indicate their levels of various symptoms on a 4-point scale. Each item is scored from 0 to 3. Therefore, scores range from 0 to 21 for both anxiety and depression, with high scores reflecting high levels of anxiety and depression symptoms (see Appendix 1, pg. 362 for the HADS).

The HADS has been used extensively in hospital and primary care patients and in the general population and reviews of its use confirm its value as a case finder for anxiety disorders and depression in these populations (Cooper et al, 2007).

Bjelland et al (2002) conducted a literature review and reported that: “we found evidence that HADS has the same properties when applied to samples from the general population, general practice, and psychiatric patients” (pg. 75).

Even though the HADS has been used frequently to identify cases of anxiety and depression in somatic patients, there is no single, generally accepted cut-off score (Herrmann, 1997). When designing the HADS, Zigmond and Snaith (1983) proposed a cut-off of ≥8 to indicate possible cases, and ≥11 to indicate probable cases. These values have been used by the majority of researchers who have since utilised the HADS (Cooper et al, 2007; Lowe et al, 2004). Several studies have recently been carried out in primary care populations and/or musculoskeletal patient samples, with the majority of these also utilising the ≥8 cut-off for possible cases and/or the ≥11 cut-off for probable cases (Cameron et al, 2008; Cooper et al, 2007; Keeley et al, 2008; Olsson et al, 2005). In addition, Bjelland et al’s (2002) review identified relatively little variability, with cut-offs being very close to the ≥8 (possible cases) proposed by Zigmond and Snaith in their original HADS paper (1983). Olsson et al (2005) also added that a cut-off score of ≥8 seems appropriate for detecting anxiety and depression among patients attending primary care, however Crawford et al (2001) reported that it may be more appropriate to use a cut-off of ≥11 to classify only moderate and severe cases. Herrmann (1997) commented on this matter, stating that: “If it is necessary to identify almost all cases, even at the cost of a relevant number of false positives, it will be useful to choose a low cut-off. In other settings, where, for example, only few severely disordered patients can be offered an expensive intervention, a higher cut-off will be more appropriate” (pg. 21).

For the purposes of the current study, the cut-off of ≥11 will be used to detect probable cases of anxiety and depression. This is a more appropriate method, as the aim of this study is to identify moderate and severe cases for further examination. Due to the nature of the study (purely research-based), it is not necessary to identify all possible cases – there will be no negative consequences if cases are not identified. The mean baseline HADS scores also support the decision to use a higher cut-off (mean scores = 8.3 and 6.5 for anxiety and depression, respectively). Using a cut-off of ≥8 would identify a large number of possible cases (particularly for anxiety), and it would therefore be difficult to draw any firm conclusions from the data.

Baseline scores on the HADS ranged from 0 to 21 within the BeBack sample for both anxiety and depression. Anxiety was low in the sample, with a mean score of 8.26 (SD = 4.55). This low mean score is similar to the mean score of 7.5 reported by Runkewitz et al (2006) in their primary care sample of patients with musculoskeletal conditions. It thus reflects the expected level of anxiety within a primary care sample.

Depression was also low in the sample, with a mean score of 6.53 (SD = 4.37). This score also corresponds with the findings of Runkewitz et al (2006), who reported a mean HADS depression score of 5.8. Levels of depression within the current study were therefore also as expected.

Median anxiety and depression scores were 8 and 6, respectively. These scores are notably similar to the mean scores, suggesting that the mean scores were not greatly affected by outliers. Furthermore, 46% of patients scored within three points of the mean on both anxiety and depression, showing a clustering of scores around the mean (i.e. the lower end of the scoring scale).

3.5.2. The Tampa Scale for Kinesiophobia

The Tampa Scale for Kinesiophobia (TSK) (Miller et al, 1991) was used to measure fear avoidance beliefs in the BeBack sample (see Appendix 1, pg. 371 for the TSK). The TSK is a 17-item measure utilising a four-point Likert response scale from 'strongly disagree' to 'strongly agree'. Total scores range from 17 to 68, with higher scores indicating greater fear.

Branstrom and Fahlstrom (2008) stated that TSK scores are used to classify patients into high and low kinesiophobia groups, however they also pointed out that: "there is no consensus among authors regarding appropriate cut-off scores" (pg. 378). The need for these cut-off scores was reflected by Woby et al (2005), who reported that: "Identifying a specific cut-off score of the TSK that reflects an important reduction in fear of movement would serve as a useful criterion by which to judge the efficacy of a particular intervention (i.e. how many patients exhibited an important reduction in their fear of movement). Furthermore, it would allow patients to be sub-categorised, on the basis of their cut-off score, following treatment. This would enable investigators to explore whether specific factors predict important reductions in fear of movement. Interventions could then be modified so that they explicitly target those factors that predict important reductions in fear of movement" (pg. 138).

Branstrom and Fahlstrom (2008) reported a mean TSK score of 39.6 in their sample of Swedish Pain Rehabilitation Clinic patients. They stated that this was comparable to TSK scores in previous studies (Crombez et al, 1999; Klaber Moffett et al, 2005), which varied between 33.5 and 44.5. The mean TSK score in

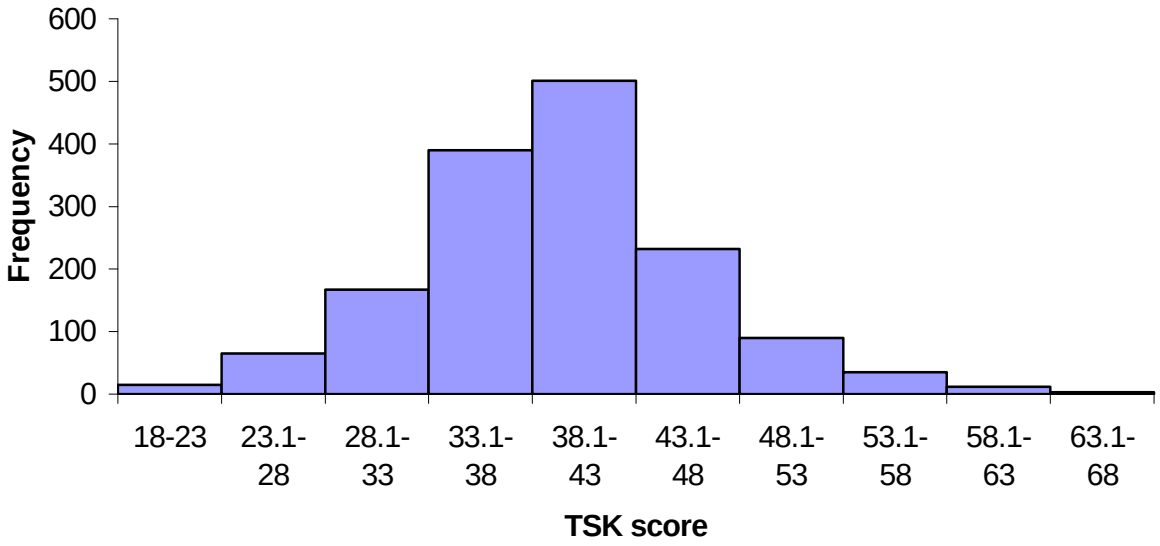
the BeBack sample (baseline) was 39.7, practically replicating that of Branstrom and Fahlstrom (2008).

With their mean TSK score of 39.6, Branstrom and Fahlstrom (2008) used a cut-off score of >37 to indicate high kinesiophobia, and ≤37 to indicate low kinesiophobia. This cut-off score resulted in 56% of their sample being classified as having high kinesiophobia. They reported that both their cut-off score (>37) and the frequency of patients with high kinesiophobia in their sample (56%) were in accordance with Vlaeyen et al (1995) and Lundberg et al (2006), who reported frequencies of 48% and 54%, respectively. However, for the purposes of the current study, it is preferable to use a TSK cut-off which is higher than the mean TSK score for the sample, in order to identify only those individuals with higher than average fear of movement/(re)injury. Nederhand et al (2004) used a cut-off score of ≥41 in a pain population. This cut-off has also been used in a primary care LBP population (Hill et al, 2008), and will therefore be used as the cut-off for high kinesiophobia in the current study. As the mean TSK score in the current study was 39.7, this cut-off (≥41) should be more effective in identifying very high levels of kinesiophobia than the lower cut-off (>37) used by Branstrom and Fahlstrom (2008).

The positive kurtosis value for kinesiophobia scores here indicates that the distribution of scores is peaked (i.e. scores clustered in the centre of the range). The histogram confirms this, showing a relatively normal distribution of scores (see figure 3.5). Scores on the TSK ranged from 18.06 to 68.00 in this sample, with a mean score of 39.67 (SD = 6.89), and a median score of 40.00. The mean score is similar to scores reported in other primary care low back pain cohorts. For example, a mean score of 38.1 was reported by Swinkels-Meewisse et al (2003),

thus showing that kinesiophobia within the BeBack sample was at the expected level. In addition, the inter-quartile range (IQR) was 36 to 43, with 41.32% of patients scoring within three points of the mean. This further demonstrates the clustering of scores around the centre of the scale range.

Figure 3.5: Range of TSK scores among baseline responders



3.5.3. The Pain Self-Efficacy Questionnaire

The Pain Self-Efficacy Questionnaire (PSEQ) (Nicholas, 1989) was used to measure pain self-efficacy beliefs in the BeBack sample (see Appendix 1, pg. 379 for the PSEQ). The PSEQ is a 10-item measure utilising a seven-point Likert response scale (from 0 to 6), with total scores ranging from 0 to 60 (higher scores indicate stronger self-efficacy beliefs). Several authors have used PSEQ cut-off scores, however they do not all agree on what is an appropriate cut-off, particularly when reporting what is a low PSEQ score.

Nicholas (2007) classified high PSEQ scores as >40, stating that once clients with persisting pain reach scores over 40 they are likely to sustain, or build on, their functional gains. This reflects previous research, which found that scores >40 at initial assessment predicted good response to an exercise programme, and also predicted return to work and maintenance of functional gains in occupational samples (Adams and Williams, 2003; Cohen et al, 2000; Tonkin, 2008). Lower scores of around 30 were less likely to predict these things (Coughlan et al, 1995). Further support for this high score cut-off point comes from Williams et al (1996; 1993), who found scores of around 40 in patients who generally maintained their treatment gains at 6- and 12-months follow-up.

Researchers have used various cut-offs to indicate low PSEQ scores. For example, Coughlan et al (1995) identified scores <17 to be very low, reflecting patients' beliefs that pain relief was necessary before becoming more active. However, several researchers have defined low PSEQ scores as <20 in chronic low back pain patient populations, finding that these low scores indicated greater focus on the pain, and were likely to limit the patient's willingness to exercise independently (Frost et al, 1995; Tonkin, 2008).

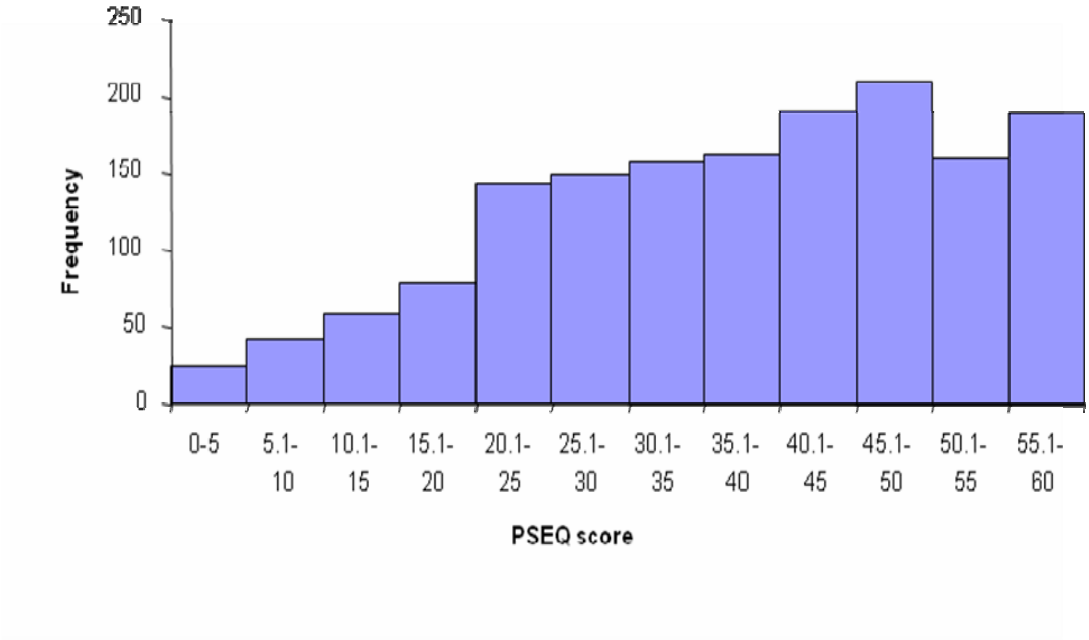
In line with the research evidence presented above, the current study will use a high score cut-off of >40 and a low score cut-off of <20 for the PSEQ. The mean self-efficacy score in the current study was 37.8, suggesting that the high score cut-off (>40) should effectively identify those individuals with higher than average levels of self-efficacy, who could potentially benefit from active pain management, such as exercise programmes. As the low score cut-off (<20) is substantially lower than the mean in this sample, it should hopefully identify individuals whose low self-efficacy may be negatively affecting their coping efforts.

PSEQ scores in the BeBack sample ranged from 0 to 60, with a mean score of 37.81 and a median score of 40.00. Figure 3.6 shows that only small numbers of patients achieved low scores on the PSEQ, however the distribution of scores across the higher end of the range appears quite variable. This indication is confirmed upon closer inspection of the frequency data. The variability in PSEQ scores is highlighted by the large standard deviation (14.56) and the low percentage of patients scoring within three points of the mean (12.25%).

3.5.4. The Coping Strategies Questionnaire-24

Cognitive coping strategies were measured by the Coping Strategies Questionnaire-24 (CSQ-24) (Harland and Georgieff, 2003) (see Appendix 1, pg. 372 for the CSQ-24). This questionnaire is a relatively recent adaptation of the original CSQ, adapted through the use of principle components analysis (Harland and Georgieff, 2003). The CSQ-24 is a shorter and therefore more clinically useful version of the CSQ, comprising four subscales: catastrophizing (measuring negative self-statements, catastrophizing thoughts and ideation), diversion (measuring an increase in cognitive or behavioural activities as a means of diverting attention away from pain), reinterpretation (measuring both ignoring and reinterpreting pain sensations), and cognitive coping (measuring coping self-statements). Scores on these subscales ranged from 0 to 36 (0 to 30 for cognitive coping), with higher scores indicating greater use of the specific coping style. The cognitive coping subscale had the highest mean score (mean = 16.27, median = 16.00), and it was also the subscale with the least variance in scores across the

Figure 3.6: Range of PSEQ scores among baseline responders



sample (SD = 6.48, IQR = 12 to 21, with 34.60% of patients scoring within three points of the mean). The diversion subscale had a mean of 15.51 across the sample (median = 16.00, SD = 8.24, IQR = 10 to 21), the catastrophizing subscale had a mean of 9.96 (median = 9.00, SD = 7.97, IQR = 3 to 15), and the reinterpretation subscale had a mean of 7.83 (median = 6.00, SD = 6.99, IQR = 2 to 12). Diversion, catastrophizing, and reinterpretation scores were also more variable than cognitive coping scores (percentages of patients scoring within three points of the mean were 26.48%, 27.41%, and 29.43%, respectively). The histograms (see figures 3.7 and 3.8) show that for catastrophizing and reinterpretation, a greater number of patients achieved scores at the lower end of the range. Figures 3.9 and 3.10 show that diversion and cognitive coping scores were more normally distributed.

The CSQ-24 has not been widely used since its development, with many researchers opting to use the full CSQ instead. Therefore, the only real

comparable data that exists is for the catastrophizing subscale, as this is identical in both the CSQ and CSQ-24 versions of the questionnaire. Hay et al (2005) utilised two primary care samples of low back pain patients, reporting mean catastrophizing subscale scores of 8.4 (SD = 6.7) and 7.9 (SD = 6.7). These scores are similar to the mean catastrophizing score reported here for the BeBack sample (9.96, SD = 7.97), showing that scores at the lower end of the range are common amongst primary care patients. Mean catastrophizing subscale scores were also reported by Denison et al (2004) for their two samples of patients recruited from physical therapy departments. They reported mean scores of 11.9 (SD = 7.1) and 12.2 (SD = 7.6). These scores are slightly higher than those reported in primary care samples, however they are still towards the lower end of the scoring range.

Figure 3.7: Range of CSQ catastrophizing subscale scores among baseline responders

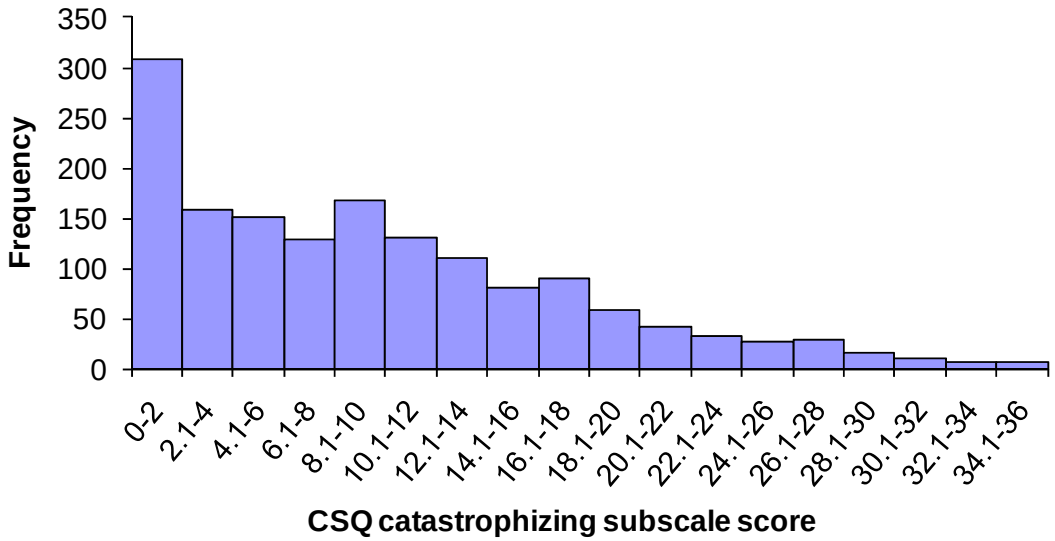


Figure 3.8: Range of CSQ reinterpretation subscale scores among baseline responders

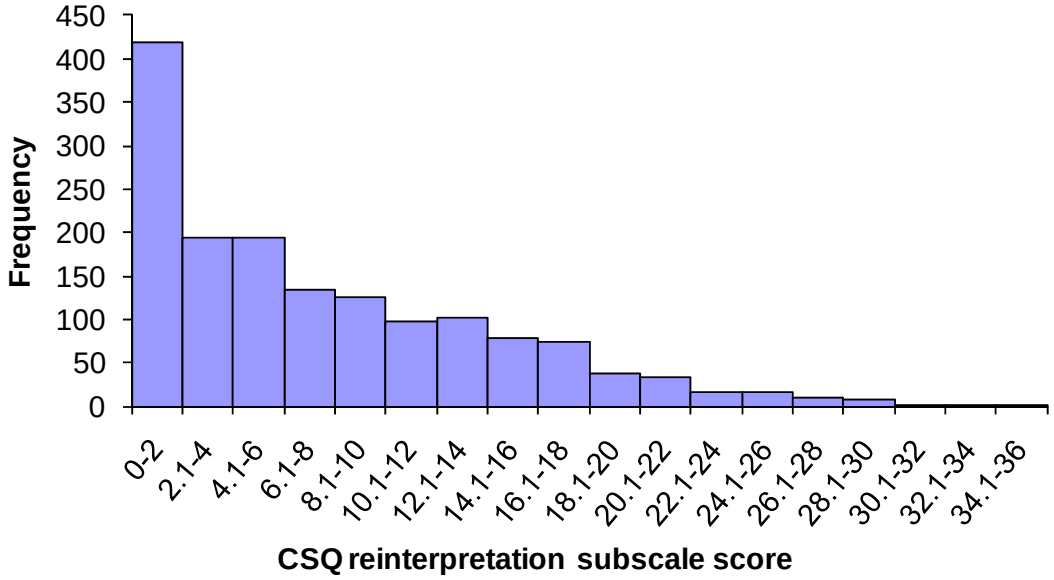


Figure 3.9: Range of CSQ diversion subscale scores among baseline responders

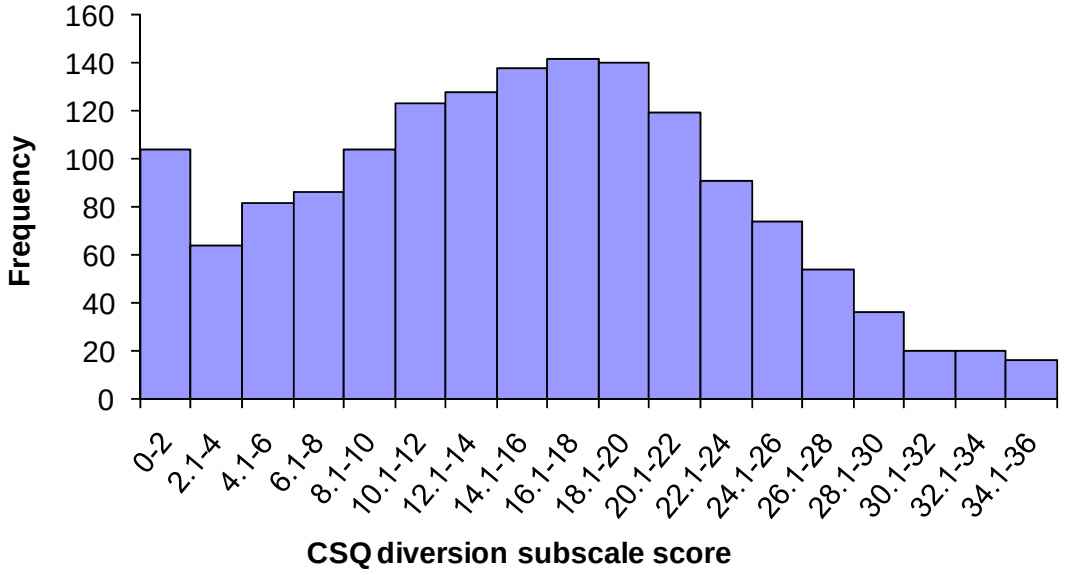
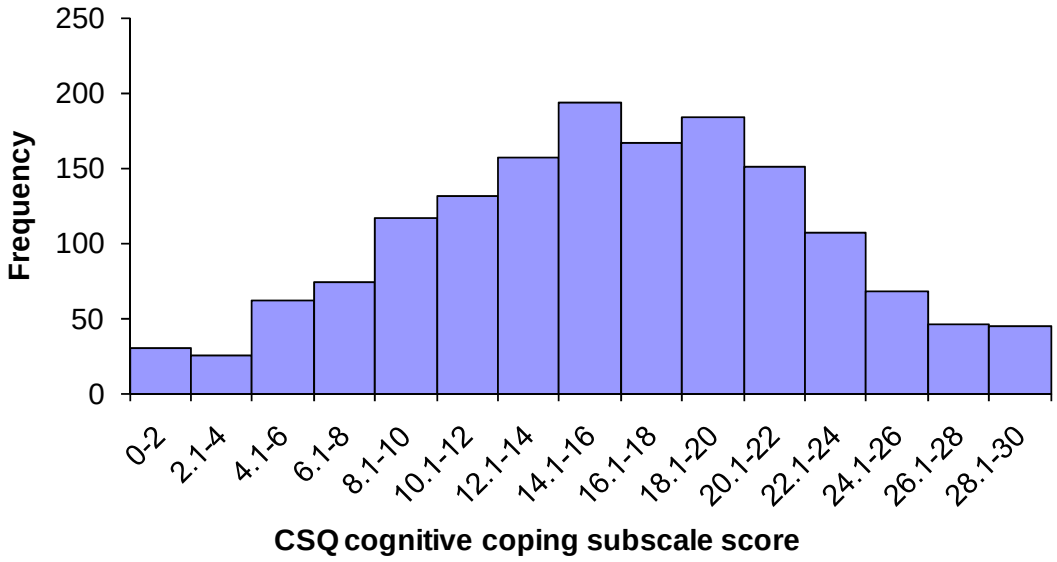


Figure 3.10: Range of CSQ cognitive coping subscale scores among baseline responders

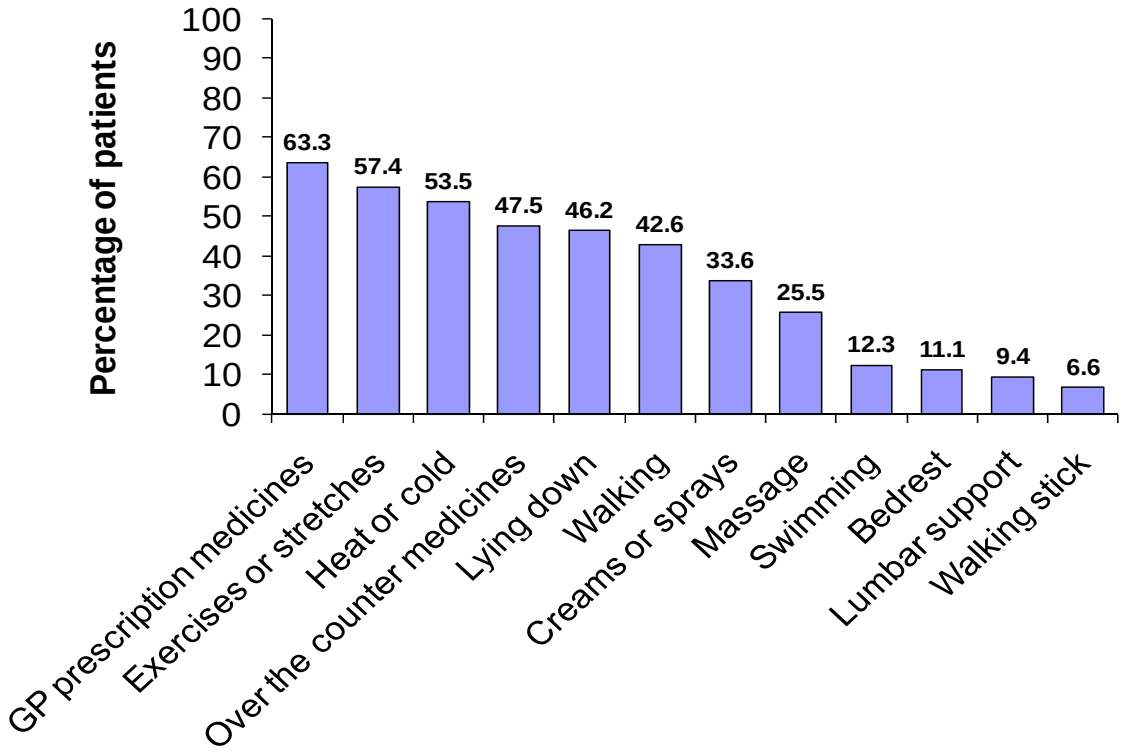


3.5.5. Behavioural coping strategies

Behavioural coping strategies were measured by a series of questions on self-care methods used over the previous four weeks (see Appendix 1, pg. 369). Twelve different self-care methods were listed, as well as an 'other (please specify)' option. Patients were simply asked to indicate which of the methods they had tried in the last four weeks to ease their back pain. Figure 3.11 shows the percentage of patients who reported using each behavioural coping strategy. The most frequently used strategy was the taking of GP prescription medication (n = 1,006, 63.3%). Taking of over the counter medication was also reported by a large number of patients (n = 756, 47.5%). Other frequently used behavioural strategies included exercise or stretches (n = 912, 57.4%), heat or cold application (n = 851, 53.5%), lying down for short periods (n = 734, 46.2%), walking (n = 677, 42.6%),

the use of creams or sprays (n = 535, 33.6%), and massage (n = 406, 25.5%). Other behavioural coping strategies (bedrest, lumbar support, swimming, walking stick) were used infrequently across the sample (range n = 105 to 196, range % = 6.6% to 12.3%). 7.7% of patients (n = 122) reported using 'other' behavioural coping strategies. These included using crutches or wheelchairs, light gym work, and herbal treatments or aromatherapy. These self-care questions were not taken from any standardised measurement instrument, therefore no comparable data exists. Figure 3.11 clearly shows that patients often reported using more than one behavioural coping strategy. This will be discussed further within the behavioural coping chapter (see Chapter 4).

Figure 3.11: The percentage of patients using behavioural coping strategies



3.6. Conclusion

Analysis of the BeBack sample demographics showed that the sample consisted of more female than male participants. This is often the case with research studies, and does not indicate that this sample is more biased in terms of gender than other samples. It is also important to consider that the majority (58.9%) of patients who were still employed at baseline had taken time off work due to low back pain in the previous six months, indicating the negative impact of low back pain for many individuals. As job dissatisfaction within the sample was low, it is unlikely that this contributed to the numbers of patients taking time off work.

The treatment services used by patients in the sample were at the expected levels, with low usage of all private services, as well as NHS services that were deemed inappropriate for the majority of patients at their current low back pain stage (four weeks post-consultation).

This chapter also described coping strategy use, highlighting further similarities between the current sample and other primary care low back pain cohorts (e.g. levels of anxiety and depression were low within the sample, reflecting expectations). It can be concluded from the descriptive analyses reported here that the BeBack cohort is a useful primary care cohort dataset. It appears to be representative of primary care low back pain patients and is therefore suitable for use as part of the detailed exploration of coping in low back pain that this thesis proposes to undertake.

The following chapter (see Chapter 4) will further explore the behavioural coping strategies in order to expand on current knowledge of behavioural coping and to develop a new measurement instrument for use in future research.

4. Factor analysis of the behavioural coping variables

This chapter aims to provide a detailed overview of the measurement of behavioural coping strategies and to develop a new measure of behavioural coping for use in this thesis.

4.1. Background

In an attempt to provide a clearer conceptualisation of coping, Chapter 1 of this thesis suggested a conceptualisation of coping as cognitive or behavioural. Cognitive coping strategies can be regarded as patients' coping thoughts, whereas behavioural coping strategies can be regarded as patients' coping actions. There has been much research investigating the role of cognitive coping strategies (see Chapter 1), with an array of measurement instruments having been developed and validated for use in clinical practice and research. However so far, the systematic review in Chapter 2 highlighted a lack of research focus on behavioural coping, suggesting that this has been neglected to date. As a result, no standardised measure of behavioural coping with pain currently exists. This chapter therefore aims to develop the first instrument to specifically measure behavioural coping activities in low back pain. This aim will be addressed using the analytic technique known as factor analysis, which will enable behavioural coping factors to be identified within the data. This chapter will therefore describe the factor analytic technique, including the requirements for its use and the interpretation of its results, and will examine the BeBack dataset to determine its suitability for factor

analysis. Following this, the results of factor analysis within the BeBack dataset will be presented and discussed.

4.1.1. Factor analysis

Factor analysis is a method of obtaining meaningful factors from a dataset through the explanation of correlations or covariances. When looking at a set of variables, researchers can use factor analysis to reduce the data they have (i.e. by combining the original variables) using a smaller set of components, or factors (Pallant, 2007). This technique is used in healthcare research, either to aid the development and evaluation of tests and scales, or to reduce a large set of variables to a more manageable number for use in later analyses (e.g. multiple regression).

There are two types of factor analysis – exploratory and confirmatory. Exploratory factor analysis (EFA) is used in the earlier stages of research, to explore interrelationships between variables. It looks for constructs within the data, and produces groups of variables relating to these different constructs. Confirmatory factor analysis (CFA) is used in the later stages of research to confirm a previously reported structure underlying a set of variables. It is an exact test of new data against established models (Ferguson and Cox, 1993). Pallant and Bailey (2005) provide a good example of the use of these different types of factor analysis in a study exploring the structure of the Hospital Anxiety and Depression Scale (HADS) in musculoskeletal patients. They divided their sample into two halves, then used EFA on the first half to establish the structure of the

HADS (this had not previously been done amongst musculoskeletal patients), and CFA on the second half to confirm the identified structure.

Given that behavioural coping factors in low back pain have not previously been well investigated within the literature, and that this factor analysis is a preliminary investigation representing an early stage in the research process, EFA was selected as the most appropriate approach to establish an initial factor structure.

4.1.2. Requirements for exploratory factor analysis

In order to perform a factor analysis, the dataset must fulfil certain requirements. First, the sample must be sufficiently large, with a suggested minimum of 300 cases (Tabachnick and Fidell, 2007). Second, factor analysis is usually performed on a set of continuous variables, but the issue of using binary data has been explored by researchers and it is accepted that: 'where Likert-type scaling is inappropriate (for example, in the measurement of such dichotomies as biological sex, or with forced choice questions), it is still acceptable to use exploratory factor analysis' (Ferguson and Cox, 1993, pg 86).

In addition to the above criteria, there are two additional tests that should be performed, in order to determine whether a dataset is suitable for factor analysis (Pallant, 2007). The first of these is Bartlett's test of sphericity, which should be significant ($p<0.05$) (Bartlett, 1954). A significant Bartlett's test indicates that the null hypothesis (a hypothesis stating that there will be no correlation between the variables) is false (i.e. there is a degree of correlation between the variables), hence factor analysis is appropriate. The second test is the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (Kaiser, 1970; 1974). This tests whether

the partial correlations amongst the variables are small (i.e. it is an indication of unique variance). This ranges from 0 to 1 with a value close to 0 indicating a spread of correlations meaning factor analysis is not appropriate, and a value close to 1 indicating that factor analysis should yield reliable factors. Tabachnick and Fidell (2007) suggest a minimum KMO value of 0.6 for a good factor analysis.

4.1.3. Factor extraction

There are a number of different extraction techniques that can be used (e.g. principal components, principal axis factoring, image factoring) (Pallant, 2007). Principal axis factoring is the most commonly used technique for EFA (Warner, 2007). Principal components analysis (PCA) is also commonly used, but it is slightly different to EFA. Where EFA is a latent variable method, looking for common variance to identify the underlying factors within a set of variables and accounting for correlations among the variables, PCA is a data reduction method, used to identify a smaller number of underlying components within a set of variables and accounting for the variance in the variables, rather than the correlations among them. The two techniques use different mathematical models, and Haig (2005) stated that 'EFA should always be used in preference to PCA when the underlying common causal structure of a domain is being investigated' (pg 321). Harrington (2009) also stated that EFA may be used as an exploratory first step during the development of a measure, and that it provides a firmer foundation than PCA for later CFA.

To determine the number of factors present within a dataset, traditionally, reference is first made to Kaiser's criterion and secondly to the scree plot (Catell,

1966). Kaiser's criterion produces eigenvalues for each factor, which represent the amount of the total variance explained by that factor. All factors with eigenvalues above 1 are usually retained. The scree plot is a plot of the eigenvalues and should be examined to identify the point at which there is a break in the curve. This break is called the 'elbow', and all factors above the elbow are usually retained. However, interpretation of the scree plot can often be difficult when a clear elbow is not present, or when an elbow is apparent at more than one point. A combination of both Kaiser's criterion and the scree plot is generally recommended when determining the number of factors to be retained, as there is also the problem that Kaiser's criterion tends to capitalize on chance and thus often overestimates the number of factors present. Another method that can be used to further aid interpretation is the use of a random split of the data. This effectively provides two separate samples for comparison and can help to support the decision to retain a certain number of factors. It is also possible to 'force' a particular number of factors to be extracted, and this technique is generally used to explore several different factor solutions.

4.1.4. Factor rotation

There are several different methods of factor rotation that can be used. The goal of factor rotation is to find a solution for which each variable has only a small number of large loadings (i.e. is affected by a small number of factors, preferably only one). Factor rotation produces a number of positions of the factor axes and identifies the clearest solution, thus aiding interpretation. There are two types of rotation that can be used, either orthogonal (the most common method is the

varimax rotation) or oblique (the most common method is the direct oblimin rotation). However, there is much debate as to which is the best method (Ho, 2006). Ferguson and Cox (1993) noted that orthogonal rotation assumes independence amongst factors and is therefore recommended if the resulting factors can be thought of as uncorrelated, although many authors suggest that this is rare in the social sciences (Costello and Osborne, 2005; Preacher and MacCallum, 2003). If orthogonal rotation is used when factors are correlated, any information about correlation between the factors will be lost. Oblique rotation is recommended as an alternative if there is a chance that the factors may be correlated. The benefit of using oblique rotation is that, whilst allowing for a degree of correlation amongst the factors, if the factors are in fact uncorrelated, oblique rotation will produce the same results as orthogonal rotation. Pallant (2007) argues that for this reason, researchers should always begin with oblique rotation, although most researchers conduct both oblique and orthogonal rotations and then report the clearest solution.

4.1.5. Factor loadings

Once the number of factors within a set of variables is determined, attention must be paid to the factor loading scores given for each variable. A factor loading is the correlation of the individual variable with the overall factor, and this therefore aids interpretation of the factor structure, helping to determine whether some of the variables are redundant. Although there is no absolute rule, many researchers use a cut-off of 0.3 for factor loadings, as anything smaller only accounts for up to 9% of the variance (Anthony, 1999; Pallant, 2007). So if a variable loads above 0.3, it

is correlated with that particular factor and therefore 'belongs' to the factor. If a variable loads below 0.3 on all factors, this indicates a failure to load and the variable should not be included in the factor structure. Additionally, if a variable loads above 0.3 on more than one factor, it can be said to be cross loading, indicating possible conceptual overlap (Ferguson and Cox, 1993). Cross loading variables are therefore over-represented within the factor structure (due to their presence within more than one factor), and should be treated with caution. Ideally, each factor should have at least three variables loading onto it, as Costello and Osborne (2005) stated that factors with less than three variables are considered to be unstable.

In addition to examining the factor loadings, a Cronbach's alpha coefficient can be calculated for each of the factor scales, to determine if any variables should be removed. DeVellis (2003) reported that ideally, the Cronbach alpha coefficient of a scale should be above 0.7. However, Cronbach alpha values are quite sensitive to the number of variables in a scale. Therefore if the factor scales are relatively short (e.g. less than ten variables), a lower Cronbach alpha value (roughly 0.5) should be expected (Pallant, 2007).

4.2. Methods

4.2.1. Initial examination of the suitability of the BeBack cohort dataset

The section of the BeBack questionnaire measuring behavioural coping (see Appendix 1, pg. 369) consisted of the following 13 variables: GP prescription medicines, over the counter (OTC) medicines, lying down, creams or sprays,

exercises or stretches, heat or cold, bedrest, massage, lumbar support, walking, swimming, walking stick, and ‘other’. The variable measuring ‘other’ behavioural coping was excluded because patients reported a wide variety of things. The remaining 12 variables were used for the EFA.

The BeBack cohort consisted of 1,591 participants at baseline, therefore far exceeding the suggested minimum of 300 cases (Tabachnick and Fidell, 2007). In order to ensure suitability of the data for factor analysis, Bartlett’s test of sphericity and the KMO measure of sampling adequacy were performed.

It was decided that, due to its exploratory nature and utility in the development of measurement instruments, EFA would be more appropriate for use here than PCA in attempting to address the aims of this chapter, therefore the remaining 12 variables were factor analysed using principal axis factoring. In addition, the oblique method of rotation was used (direct oblimin rotation), due to the high likelihood of correlation between the factors. In order to enable a thorough investigation of the number of factors present within the dataset, it was decided that all three approaches (Kaiser’s criterion, scree plot, and random data split dividing the sample into two random halves for separate analysis) would be utilised to determine the number of factors to be extracted. It was also decided that if the first solution was not optimal, then several different possible factor solutions should be forced in order to find the optimal solution. Factor solutions were examined for face validity and stability, followed by examination of their internal consistency in order to report the best possible factor structure for the behavioural coping variables.

4.3. Results

4.3.1. Exploratory factor analysis

The dataset produced a highly significant Bartlett's test ($p<0.001$) and a KMO value of 0.651, therefore confirming that factor analysis was appropriate for use on the behavioural coping variables. Table 4.1 shows the total variance explained by the factors. Using Kaiser's criterion to determine the number of factors to extract, it is evident that four factors have eigenvalues above 1, and these four factors explain a total of 47.33% of the variance.

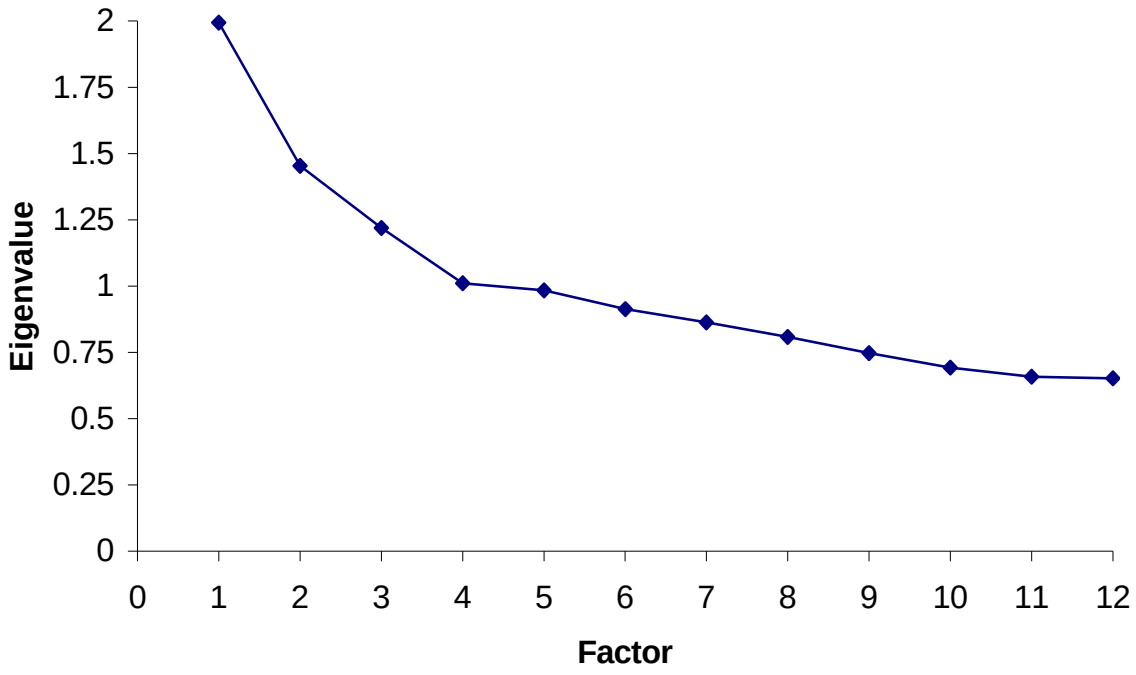
Table 4.1: Total variance explained by the extracted factors (n = 1,591)

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	1.99	16.62	16.62	1.29	10.73	10.73	1.02
2	1.45	12.12	28.74	0.75	6.24	16.97	0.92
3	1.22	10.16	38.90	0.49	4.11	21.07	0.60
4	**1.01**	**8.43**	**47.33**	**0.33**	**2.75**	**23.82**	**0.89**
5	0.98	8.20	55.53				
6	0.91	7.62	63.14				
7	0.86	7.19	70.34				
8	0.81	6.74	77.08				
9	0.75	6.22	83.30				
10	0.69	5.77	89.08				
11	0.66	5.49	94.57				
12	0.65	5.43	100.00				

The scree plot (see figure 4.1) seems to show some support for a four-factor solution, as there appears to be a possible elbow located between factors four and five. However, there is also a noticeable change of direction between factors two and three, with the fourth factor explaining a much lower percentage of the variance than the first three factors. This indicates that a two-factor, or possibly

three-factor, solution may be more appropriate. Therefore, clear conclusions cannot be drawn from the scree plot. Looking at the Eigenvalues in table 4.1, there was no clear increase in variance at any point, therefore it is not possible to unequivocally propose a four-factor solution to be optimal, and the factor structure must be further investigated using alternative methods. The initial four-factor solution is presented below, and a random split of the data used to compare results within two separate samples. Following this, both a three-factor and a two-factor solution were forced to compare results.

Figure 4.1: Scree plot of eigenvalues for the extracted factors



4.3.2. Initial four-factor solution

The pattern matrix table (see table 4.2) shows the rotated four-factor solution, with the loading scores for each variable on the four factors. Factor loadings above 0.3 are highlighted in bold.

Table 4.2: Pattern matrix showing factor loadings for a four-factor solution

Variables	Factor			
	1	2	3	4
Lying down	**0.69**	0.09	0.02	-0.11
Bedrest	**0.41**	-0.05	0.02	0.05
Walking stick	0.20	-0.05	-0.19	0.04
Lumbar support	0.10	0.10	-0.01	0.08
Exercises/stretches	-0.13	**0.70**	-0.03	0.06
Walking	0.03	**0.41**	-0.07	0.04
Swimming	0.04	**0.32**	0.07	-0.11
Massage	0.07	0.18	0.16	0.17
GP medication	0.13	0.02	**-0.53**	0.23
OTC medication	0.10	-0.02	**0.44**	0.24
Creams/sprays	-0.04	-0.04	0.03	**0.53**
Heat/cold	0.10	0.08	-0.06	**0.47**

Table 4.2 shows that the variables loading onto factor one are lying down, and bedrest, therefore factor one could be called a ‘rest’ factor. The variables loading onto factor two are exercises/stretches, walking, and swimming, therefore representing a ‘physical activity’ factor. The variables loading onto factor three are GP prescribed medication and OTC medication, thus representing a ‘medication’ factor, and the variables loading onto factor four are creams/sprays, and heat/cold. Therefore this appears to be a ‘topical treatments’ factor. Three variables (walking stick, lumbar support, massage) failed to load on any factor. The four-factor solution appears valid, although as three out of the four extracted factors consist of only two variables, the solution can be regarded as unstable (Costello and

Osborne, 2005). In addition, a random split of the data did not fully confirm these results. Factors one ('rest') and two ('exercise') were confirmed, but the random split revealed a five-factor solution for Sample A and a four-factor solution for Sample B (see table 4.3), with the other variables loading differently and reflecting less stability.

Table 4.3: Factor solutions following a random data split

Sample A (n = 767)	
Factor 1	Creams/sprays, heat/cold
Factor 2	Exercises/stretches, walking, swimming
Factor 3	Over the counter medication, GP medication
Factor 4	Lying down, bedrest
Factor 5	Massage

Sample B (n = 824)	
Factor 1	Lying down, bedrest
Factor 2	Exercises/stretches, walking, swimming
Factor 3	Creams/sprays, over the counter medication, heat/cold
Factor 4	GP medication

These solutions (A and B) have less face validity than the initial solution, and are also less stable due to the small number of variables loading onto each factor. Therefore, in an attempt to find a more stable and more easily interpretable factor structure, factor analysis was re-run with a forced three-factor and a forced two-factor solution.

4.3.3. Forced three-factor solution

Table 4.1 shows that the first three factors explain a total of 38.90% of the variance. The pattern matrix table (table 4.4) shows the forced three-factor solution. Factor loading scores above 0.3 are highlighted in bold.

Table 4.4: Pattern matrix showing factor loadings for a forced three-factor solution

Variables	Factor		
	1	2	3
GP medication	**0.58**	-0.03	-0.14
Lying down	**0.38**	0.18	0.10
Walking stick	**0.33**	-0.04	-0.06
Bedrest	**0.31**	0.00	0.15
Lumbar support	0.12	0.10	0.08
Exercises/stretches	-0.03	**0.62**	-0.00
Walking	0.11	**0.42**	-0.02
Swimming	-0.07	**0.36**	-0.03
OTC medication	-0.19	0.00	**0.54**
Creams/sprays	0.16	-0.09	**0.37**
Heat/cold	**0.32**	0.03	**0.33**
Massage	-0.00	0.18	0.26

Variables loading onto factor one are GP medication, lying down, walking stick, bedrest, and heat/cold. Variables loading onto factor two are exercises/stretches, walking, and swimming, and variables loading onto factor three are OTC medication, creams/sprays, and heat/cold. Factor two remains the same as in the initial four-factor solution, and could therefore still be seen to be an 'exercise' factor. However, factors one and three are not so easily interpretable, as the variable groupings have less face validity than the grouping for factor two. In addition, although the three-factor solution appears to be more stable than the initial four-factor solution (i.e. factors have a larger number of variables loading onto them), the 'heat/cold' variable is cross-loading onto factors one and three, indicating an over-representation of this variable in the factor structure. For these reasons, a three-factor solution is also not optimal. Therefore, factor analysis was re-run with a forced two-factor solution.

4.3.4. Forced two-factor solution

Table 4.1 shows that the first two factors explain a total of 28.74% of the variance. The pattern matrix table (see table 4.5) shows the forced two-factor solution. Factor loading scores above 0.3 are highlighted in bold.

Table 4.5: Pattern matrix showing factor loadings for a forced two-factor solution

Variables	Factor	
	1	2
GP medication	**0.47**	-0.15
Heat/cold	**0.44**	0.14
Lying down	**0.42**	0.16
Bedrest	**0.38**	0.02
Walking stick	**0.31**	-0.12
Creams/sprays	0.29	0.07
Lumbar support	0.15	0.11
Exercises/stretches	-0.06	**0.58**
Walking	0.07	**0.38**
Swimming	-0.10	**0.34**
Massage	0.10	**0.31**
OTC medication	0.04	0.23

The resulting solution has five variables loading onto factor one (GP medication, heat/cold, lying down, bedrest, walking stick), and four variables loading onto factor two (exercises/stretches, walking, swimming, massage). Three variables (creams/sprays, lumbar support, OTC medication) failed to load on any factor. There was also a weak correlation between the two extracted factors (r = 0.21). This solution appears more stable than the three-factor solution, with a greater number of variables loading onto each factor and no cross-loading of variables. It also has more face validity than the three-factor solution, producing factors that are more easily interpretable (see factor interpretation).

A random split of the data was performed, in an attempt to provide further support for the two-factor solution. The sample was split into sample A and sample B, with approximately 50% of participants in each. The forced two-factor solutions are presented in table 4.6.

Table 4.6: Forced two-factor solutions following a random data split

Sample A (n = 825)	
Factor 1	GP medication Heat/cold Lying down Creams/sprays Bedrest
Factor 2	Exercises/stretches Walking Swimming

Sample B (n = 766)	
Factor 1	Lying down Bedrest GP medication Heat/cold Walking stick
Factor 2	Exercises/stretches Walking Massage Swimming

Table 4.6 shows that sample B fully supports the whole-sample solution (i.e. the same variables loading onto the same factors), but sample A shows a slightly different solution. Factor one includes GP medication, heat/cold, lying down, and bedrest. These variables correspond with those belonging to factor one in the whole-sample solution. However, one additional variable (creams/sprays) was found to load onto this factor. This variable failed to load in the whole-sample solution. Factor two includes exercises/stretches, walking, and swimming. These variables also correspond with the whole-sample solution, but further differences were found between the two solutions. In the whole-sample solution, two variables – walking stick and massage – loaded onto factors one and two, respectively. However, in the sample A solution, both of these variables failed to load onto any factor.

This random data split provided partial support for the forced two-factor solution, with one half of the data fully supporting the identified factors. In addition, the identified factors consisted of an adequate number of variables for the solution to be considered stable. For these reasons, the two-factor solution appears to be preferential in comparison with the four-factor solution.

Factor interpretation

The two extracted factors appear to represent ‘active’ and ‘passive’ coping. Factor one is a passive coping factor, whereas factor two incorporates all the exercise-related items and represents an active way of coping. These factors have high face validity, and reflect Brown and Nicassio’s (1987) conceptualisation of pain coping as active or passive in nature. This earlier conceptualisation defined active coping as involving strategies requiring the person to take responsibility for pain management and making attempts to control the pain or to function in spite of it. It also defined passive coping as responsibility for pain management being given to an outside source or other areas of life allowed to be adversely affected by pain. It is feasible to apply these definitions to the extracted factors, therefore supporting the factor labels. Further support for these factor labels comes from Fritz et al (2008), who stated that an active approach to care involved maintaining and promoting activity, whereas a passive approach involved interventions such as bedrest and heat/cold application.

However, despite these factors having high face validity, the inclusion of several variables within the factor structure (creams/sprays, walking stick, massage, lumbar support, and OTC medication) remains unclear. To further investigate the

importance of these variables, the internal consistency of the factor structure was examined and is described below.

4.3.5. Examination of the internal consistency of the factor structure

To examine the internal consistency of the two-factor structure, two factors were proposed as a result of the factor analysis. Factor 1 represents passive behavioural coping and includes all variables that loaded onto the passive coping factor. Variables that loaded onto this factor in only one half of the random data split were also included. Factor 2 represents active behavioural coping, and the included variables were selected in the same way as for factor 1. Two variables (OTC medication and lumbar support) failed to load onto either factor. These variables were also included here, in order to clarify their exclusion from the factor structure. OTC medication was included within factor 2 (active coping), because its loading score for factor two was notably higher than its score for factor one (see table 4.5). The loading scores for lumbar support were similar across the two factors, therefore lumbar support was included within both factors to explore its position within the factor structure. The factors used are presented in table 4.7.

Scale 1: Passive behavioural coping

The passive behavioural coping factor appears to have the expected level of internal consistency, with a Cronbach alpha coefficient of 0.50. Table 4.8 shows what the new alpha value would be if the individual variables were deleted.

Table 4.7: Behavioural coping factors developed from the factor analysis

Factor 1: Passive behavioural coping
GP medication
Heat/cold
Lying down
Bedrest
Walking stick
Creams/sprays
Lumbar support

Factor 2: Active behavioural coping
Exercises/stretches
Walking
Swimming
Massage
OTC medication
Lumbar support

Table 4.8: Alpha values if individual variables were deleted

Factor 1: Passive behavioural coping	**Cronbach's alpha if item deleted**
GP medication	0.45
Heat/cold	0.42
Lying down	0.44
Bedrest	0.46
Walking stick	0.49
Creams/sprays	0.48
Lumbar support	0.50

Table 4.8 shows that the alpha value will not increase through the removal of individual variables. However, it also shows that if lumbar support were removed, the alpha value would remain the same. Therefore, this indicates that the lumbar support variable does not add anything to the factor, suggesting that it is unnecessary to include it here. For this reason, the lumbar support variable was removed and reliability analysis was re-run with the remaining six variables. The results of this second reliability analysis are presented in table 4.9. This shows that

removing any further variables would result in a decrease in alpha, therefore the six-variable factor provides the optimum internal consistency and will be used as the scale of passive behavioural coping throughout the thesis.

Table 4.9: Alpha values if individual variables were deleted

Factor 1: Passive behavioural coping	Cronbach's alpha if item deleted
GP medication	0.44
Heat/cold	0.42
Lying down	0.44
Bedrest	0.46
Walking stick	0.49
Creams/sprays	0.48

Scale 2: Active behavioural coping

The active behavioural coping factor has lower internal consistency than the passive factor, with a Cronbach alpha coefficient of 0.41. Table 4.10 shows what the new alpha value would be if the individual variables were deleted.

Table 4.10: Alpha values if individual variables were deleted

Factor 2: Active behavioural coping	Cronbach's alpha if item deleted
Exercises/stretches	0.27
Walking	0.35
Swimming	0.37
Massage	0.36
OTC medication	0.41
Lumbar support	0.41

Table 4.10 shows that the alpha value will not increase through the removal of individual variables. However, it also shows that if the OTC medication and lumbar support variables were removed, the alpha value would remain the same.

Therefore, these variables do not appear to be adding anything to the factor. As a result, reliability analysis was re-run without these two variables (the individual variable results of this analysis are presented in table 4.11). The combined removal of these variables led to an increase in alpha, from 0.41 to 0.43.

Table 4.11: Alpha values if individual variables were deleted

Factor 2: Active behavioural coping	Cronbach's alpha if item deleted
Exercises/stretches	0.24
Walking	0.36
Swimming	0.39
Massage	0.44

Table 4.11 shows what the new alpha value would be if the individual variables were deleted from the new four-variable factor. It shows that the alpha value would increase from 0.43 to 0.44 if the massage variable were removed. Therefore, reliability analysis was re-run following the removal of this variable. The results of this third reliability analysis are presented in table 4.12.

Table 4.12: Alpha values if individual variables were deleted

Factor 2: Active behavioural coping	Cronbach's alpha if item deleted
Exercises/stretches	0.22
Walking	0.33
Swimming	0.43

Table 4.12 shows that removing any further variables would result in a decrease in alpha, therefore the three-variable factor provided the optimum internal consistency and will be used as the scale of active behavioural coping throughout the thesis.

4.4. Discussion

In an attempt to identify the underlying structure of the behavioural coping variables, several factor solutions were examined and it was concluded that a two-factor solution was the most appropriate. The internal consistency of these factors was then tested to support the inclusion/exclusion of variables, resulting in a six-variable passive coping factor and a three-variable active coping factor. Presented below is a discussion of this analysis.

4.4.1. Exploratory factor analysis

The initial EFA revealed a four-factor solution (i.e. four factors with eigenvalues above 1), explaining a total of 47.33% of the variance. This is an acceptable percentage, comparable with previous factor analytic studies of pain coping measures. For example, Hadjistavropoulos et al (1999) factor analysed the Chronic Pain Coping Inventory, reporting both seven-factor and eight-factor solutions, which explained 48.94% and 51.53% of the variance, respectively. In addition, in their development of the CSQ24, Harland and Georgieff (2003) initially reported a six-factor solution to be the most interpretable, explaining a total of 51% of the variance. However, they eventually settled on a four-factor solution, which will probably have accounted for a smaller percentage of the variance (this data was not reported in the article).

The four-factor solution was also supported by the scree plot, but the plot revealed that a two- or three-factor solution might also be appropriate. Further examination of the four-factor solution highlighted the instability of the factors due

to the small number of variables loading onto them (Costello and Osborne, 2005). This instability was also reflected in the random data split, which only supported two of the four factors across the two half-samples and produced additional factors that were conceptually ambiguous. It was felt that these issues warranted investigation of the possible two- and three-factor solutions identified by the scree plot.

The three-factor solution was conceptually and statistically weak, with cross-loading and low face validity. Therefore, it was not considered further. The two-factor solution was found to be conceptually stronger with high face validity, reflecting ‘active’ and ‘passive’ coping factors. The solution was fully supported by one half of the sample following a random data split, with the other half providing partial support. It was felt that this support from the data split, along with the increased stability of the solution, substantiated the decision to rate the two-factor solution as preferential over the four-factor solution. In addition, Kaiser’s criterion often gives too many factors, particularly when using dichotomous variables (Comrey, 1978). Therefore, the four-factor solution could simply be an overestimation of the number of factors present. As recommended by Comrey (1978), other factor solutions were investigated here, before reaching a conclusion that four factors should be extracted from the dataset. These further investigations appeared to support the indication that too many factors had been extracted initially.

Factor interpretation

The interpretation of the two identified factors as ‘active’ and ‘passive’ behavioural coping reflects the previous conceptualisation of coping outlined by Brown and Nicassio (1987). The Brown and Nicassio study (1987) did highlight both cognitive and behavioural coping (“coping refers to the specific thoughts and behaviours people use to manage their pain”, pg.53), and consequently included several behavioural coping variables within the measure that was developed. These variables included medication taking, exercise, staying busy or active, and restricting social activities. Therefore, it could be argued that Brown and Nicassio pioneered research into the development of a behavioural coping measure. However, the measure they developed (the Vanderbilt Pain Management Inventory) was not specifically focused on behavioural coping. Several cognitive coping strategies were also included, providing a measure of active and passive coping in general, and therefore limiting any further analysis of the unique impact of behavioural coping and its interactions with cognitive coping strategies.

This problem is also encountered when using the Chronic Pain Coping Inventory (Jensen et al, 1995). This measure also incorporates behavioural coping strategies (such as resting, medication taking, exercise, and asking for assistance), but combines these variables with those assessing cognitive coping strategies. The result is a general coping measure, which is unable to differentiate between the two forms of coping.

This chapter aims to develop a new measure of behavioural coping activities for use in this thesis. It will also be the first measure of this kind to be developed using a primary care sample of low back pain patients. The Vanderbilt Pain Management

Inventory was developed using a sample of rheumatoid arthritis patients recruited from rheumatology practices, and the Chronic Pain Coping Inventory was developed using a convenience sample of patients reporting a wide variety of different pain sites (with only 25% reporting low back pain). These patients were recruited from a multidisciplinary pain treatment centre, with 53% having been treated since initial screening for possible inpatient treatment. These samples therefore differ significantly from the sample of low back pain patients included here. The resulting active and passive behavioural coping factors will potentially have greater utility within a primary care population of low back pain consulters and will also uniquely enable focus on specific active and passive behavioural coping strategies. However in order for this measure to be considered for use within the field of low back pain research, it would be necessary to perform a CFA within a new dataset of primary care low back pain patients to confirm the suggested factor structure.

4.4.2. Internal consistency of the factors

Examination of the internal consistency of the factor structure resulted in a three-variable active coping factor and a six-variable passive coping factor. All possible variables were incorporated initially, including variables that only loaded onto a particular factor in one half of the random data split. Variables that failed to load onto either factor were also incorporated, thus reflecting a thorough analysis of the strength of the proposed factors.

When examining internal consistency, it has been reported that Cronbach's alpha coefficient should reach 0.7 to indicate good internal consistency (DeVellis,

2003). The active and passive factors here had Cronbach alpha coefficients of 0.44 and 0.50, respectively. These low levels of internal consistency suggest that the factors are not ideal for baseline consulters in this sample. However, the factors do seem to fit together conceptually, therefore it is important to examine why such low levels of internal consistency were achieved. One possible reason for this could be the number of variables in each scale. Pallant (2007) reported that lower Cronbach alpha values should be expected with shorter scales (e.g. less than ten variables). It was suggested that a value of roughly 0.5 should be expected. With this in mind, the Cronbach alpha value for the passive coping factor is at the expected level (0.5), although the value for the active coping factor is still lower than expected (0.44). The active coping factor only consists of three variables (half the amount of variables than the passive coping factor), therefore this could potentially explain the low alpha value.

Another possible reason for the low internal consistency could be the distribution of the variables across the sample. For example, Comrey (1978) stated that factor analysis of dichotomous variables with poor splits in the proportion of yes and no responses can introduce severe distortion into the correlation matrix with a dramatic effect on the factor analytic solution. For example: “If one variable is represented by a measure that splits 50-50 while another is represented by a measure that splits 95-5, the maximum possible correlation between the two variables is limited to an absolute value of approximately 0.23. With more appropriate measures on continuous scales, these two variables might correlate much higher. The form of measurement of these two variables imposes an artificial limit on the size of the correlation that could introduce a serious distortion in the obtained factor structure.” (Comrey, 1978: pg. 650 – 651). It is suggested that if

dichotomous measures are used, they should be as close to 50-50 splits as possible and the results should be interpreted cautiously. This could potentially be a problem for the active and passive factors here, because of the varying prevalence of the variables in the BeBack dataset. For example, within the passive coping factor, GP medication was used by 63.3% of patients whereas a walking stick was used by only 6.6%. Similarly, within the active coping factor, exercises/stretches were used by 57.4% of patients whereas swimming was only used by 12.3%. Therefore, these variations in distribution could be responsible for the low internal consistency of the factors.

In addition, it is possible that problems with the actual measurement of the variables could be responsible for the low alpha values reported here. These problems will be discussed in the following section (see section 4.4.3.).

4.4.3. Limitations

There were several limitations with the dataset. First, the 'self-care' section of the BeBack questionnaire was used for this analysis, as the variables best represented behavioural coping. The use of secondary data here limits the comprehensiveness of the research, as the questionnaire was not specifically designed for the purposes of this analysis. Therefore, the variables used are arguably not an exhaustive list of behavioural coping strategies used by patients with low back pain. If the questionnaire had been designed specifically for the analysis of behavioural coping, it is likely that several other variables would have been included in this list. This becomes evident upon examination of the patient response to the 'other' behavioural coping strategies variable. Patients reported a

wide variety of strategies here, but some were repeatedly reported, suggesting that the questionnaire failed to include these other important coping strategies. Some examples of these other behavioural coping strategies include the use of a TENS machine, the use of support items (such as wheelchairs, crutches, mobility scooters, support pillows, and holding onto another person for support), the use of specific sports or exercises (such as pilates or yoga, cycling, football, or gym work), getting on with normal activities (such as housework, gardening, and keeping moving), avoiding doing normal activities (for example getting someone else to do the ironing, taking time off work, and avoiding the gym), and water-based behavioural strategies (such as taking a bath or shower, or using a pool, sauna, spa, or jacuzzi). The failure to include these other important behavioural coping strategies reflects the limitations of using secondary data and subsequently the limitations of the findings reported here. However, the data collected on 'other' behavioural coping strategies within the BeBack cohort could be useful when designing future cohort studies, as a more comprehensive list of behavioural coping variables can now be compiled, with the potential to improve upon the identified factors and the number of variables they encompass.

A second limitation concerns the actual measurement of the coping variables. One problem lies with the fact that the questionnaire does not measure the extent to which patients have used each of the behavioural coping strategies. For example, if a patient reports that they have used a particular strategy, there is no way of knowing whether they have used the strategy just once, or whether they use it every day to cope with their back pain. This information could potentially impact on the results of future analyses that utilise this behavioural coping measure and therefore should be incorporated. If the questionnaire can be re-

designed at a later date, the extent to which patients use each of the behavioural coping strategies should be added, perhaps through the use of a Likert-type scale ranging from ‘used once’ to ‘used frequently’. Another problem lies with the hypothesis that active and passive behavioural coping are on a continuum, and the coping variables measured here do not represent the different levels of active/passive coping. For example, the active factor comprises three variables: exercises/stretches, walking, swimming. It could be argued that these variables are all measuring one extreme of the active coping continuum (i.e. the most active behaviours), and behaviours at the other end of the continuum are overlooked. For example, these could include things like keeping moving, going to work, or continuing with usual activities, such as housework. These are all active coping strategies, but they represent less extreme forms of active coping than the strategies that were investigated in the BeBack cohort study. It is important to incorporate all levels of active/passive coping, as it is possible that some patients using less extreme active coping strategies might have been missed here due to these measurement issues, and not identified as active copers. This could impact on the results of future analyses and should be considered when results of analyses using this measure are interpreted.

A further limitation concerns the lack of confirmation of the proposed factor structure. As a CFA on a new dataset was not performed, it is unlikely that this measure will be regarded as valid for use by other low back pain researchers. This also means that the analyses reported in subsequent chapters of this thesis that utilise this measure must be interpreted with caution until confirmation of the factor structure is possible. In addition, the reliability and validity of the measure (e.g.

test-retest reliability, face validity) was not comprehensively examined, as this was beyond the scope of this thesis chapter.

4.4.4. Future research

The analyses presented here have demonstrated the distinction between active and passive behavioural coping. The active and passive factors identified will be used throughout this thesis as a measure of behavioural coping. Factor scores will be produced and used to assess patients' levels of active and passive behavioural coping. Analyses will then be conducted to investigate these behavioural coping factors, by identifying if they are predictive of low back pain patient outcomes. Any differences between the factors that are found will serve to highlight the distinction between the two factors and help to provide support for the results of this factor analysis.

To improve the validity of the new measure developed here, future research should focus on confirming the proposed factor structure using CFA in a new dataset of primary care low back pain patients. In addition, a future re-design of the questionnaire should incorporate a more comprehensive list of behavioural coping variables and should address measurement limitations by ensuring that all levels of the active and passive coping continuums are incorporated and by possibly adapting the response scale to reflect the extent to which each coping strategy is used.

Additional examination of the measure's reliability and validity would also be beneficial. For example, test-retest reliability could be investigated by administering the measure to patients at two time points to determine if similar

scores are reported on both occasions (indicating good reliability of the measure). In addition, sensitivity to change could be examined by administering the measure to patients pre- and post-treatment intervention, to determine the measure's ability to detect the overall effect of treatment. Finally, face validity could be further examined by asking patients to provide a subjective judgement as to whether the measure appears to be assessing the desired qualities (i.e. active and passive behavioural coping). These are all potential avenues that could be explored through further research to provide support for the measure's psychometric properties and subsequently to support its future use in the field of low back pain research.

4.4.5. Conclusion

Factor analysis of the behavioural coping variables measured within the BeBack dataset enabled the development of a new measure of behavioural coping for use in this thesis. The EFA technique proved useful here, leading to the identification of a two-factor solution reflecting active and passive behavioural coping. The internal consistency of the factors was examined and the variables producing the highest internal consistency for each factor were retained. The resulting factors will be utilised within subsequent chapters of this thesis as a measure of behavioural coping strategies, representing the first specific measure of behavioural pain coping to be developed for use with primary care low back pain patients. Future research should address the potential limitations reported here. In particular, a CFA of the measure in a new dataset is required to confirm the reported factor structure.

The following chapter (see Chapter 5) will provide a detailed overview of the measurement of cognitive coping, including an examination of the suitability of the Coping Strategies Questionnaire-24 for use in the remaining chapters of this thesis.

5. Measurement of cognitive coping strategies and factor analysis of the Coping Strategies Questionnaire-24

This chapter aims to provide a detailed overview of the measurement of cognitive coping strategies by reviewing available standardised tools, including the Coping Strategies Questionnaire-24 (the coping measure used in the BeBack study). It also aims to determine whether this measure is suitable for use in the analysis of coping in the remaining thesis chapters by examining the measure's factor structure.

5.1. Composite measures of coping

Although systematic measurement of behavioural coping within back pain research studies is currently lacking (see chapter 4), there is a considerable wealth of literature on cognitive coping, with several measurement tools and composite measures having been developed and validated. The term 'composite measure' refers here to a measure that combines several coping dimensions, rather than one which focuses on a single dimension. An examination of the advantages and disadvantages of using composite measures of coping will be provided here. A brief overview of some of the most common composite measures of cognitive coping will also be provided, to demonstrate the strengths and weaknesses of these tools and to provide justification for the use of the Coping Strategies Questionnaire-24 (CSQ-24) within the dataset utilised by this thesis, the BeBack study. However, a comprehensive systematic review of available tools is outside the scope of this thesis. For a more in-depth critique of composite coping

measurement tools, see Boothby et al (1999), DeGood and Tait (2001), and Schwarzer and Schwarzer (1996).

5.1.1. Advantages and disadvantages of using composite measures of coping

It is often the case that researchers will use a composite measure without considering the advantages and disadvantages of this approach. It is important to be aware of these issues when deciding which approach to use, therefore some of the key issues raised by researchers in the field will be discussed here.

There are advantages and disadvantages to using individual or composite scores. Jensen et al (1992) stated that composite measures increase the interpretability of results and the power and reliability of the statistical analyses, as well as identifying general dimensions of coping. However, they also stated that: "the exclusive use of composite measures may obscure the importance of specific pain coping strategies as they relate to functioning" (Jensen et al, 1992, pg 274). Therefore, the main disadvantage of using composite measures is that specific (individual scale score) relationships may be obscured. DeGood and Tait (2001) commented that it is possible that limited numbers of specific coping strategies are primarily responsible for good adjustment to chronic pain, and the exclusive use of composite coping measures may limit the ability to identify those specific strategies. Jensen et al (1992) substantiated these concerns by conducting a study comparing composite scores with individual coping scale scores in the prediction of adjustment. They found that the individual scale scores generally yielded more information than the composite scores, indicating a loss of information through the use of composite measures. They concluded that the

exclusive use of composite measures might hide important relationships between variables. However, despite this limitation, the use of composite measures can help researchers to draw conclusions regarding coping dimensions and trends in coping styles. This could be particularly useful in an applied setting, enabling identification of those patients whose coping styles might serve to hinder their recovery. It is important for researchers to consider these issues when selecting a coping measure for use in their studies, so they can make an informed decision as to the measure and approach that they choose.

The following sections provide an overview of some common composite measures of cognitive coping cited within the pain literature, outlining first generic coping measures (measuring coping with stressful episodes or problems) and then pain-specific measures (measuring coping specifically with pain) in order to evaluate the utility of these measures within the context of this thesis, as well as the wider field of pain coping research.

5.1.2. Generic coping measures

This section explores two generic coping measures that have occasionally been cited within the pain coping literature, the Ways of Coping Checklist (Folkman and Lazarus, 1980) and the Daily Coping Inventory (Stone and Neale, 1984). Although these measures are not commonly used within pain coping research, it is important to explore their development and identify possible reasons for their limited utility here.

Ways of Coping Checklist

The Ways of Coping Checklist (WCCL) was developed by Folkman and Lazarus (1980) using a general population sample (n = 100) aged 45 to 64 years. It consists of 68 items describing a broad range of coping strategies that an individual might use in a specific stressful episode. Respondents must indicate either ‘yes’ or ‘no’ for each item, and always with a specific stressful event in mind. Items on the checklist comprised two categories: problem-focused and emotion-focused coping (see Chapter 1 for more information regarding this conceptualisation of coping). Folkman and Lazarus (1980) found the two scales to have acceptable internal consistency, however the measure has not been popular in pain-related research studies. This could potentially be because the factor structure has not been shown to be replicable with chronic patient populations (Wineman et al, 1994), because the measure was not designed for specific health conditions (Endler et al, 1993), or because the measure is not operationally easy to use, given its length. A shorter, revised version of the WCCL was developed by Vitaliano et al (1985), consisting of 42 items across five subscales. This revised WCCL is preferred over the original due to its shorter length, increased reliability, and reduction in shared variance between the subscales. Several researchers have chosen to use it over the original version when investigating coping amongst chronic low back pain patients (Klapow et al, 1995; Turner et al, 1987), although it has also seen relatively little recent use in pain populations (DeGood and Tait, 2001). This could again be due to the populations used in the development of the measure (i.e. no chronic pain patients). In addition, although shorter than the original, the revised WCCL is still relatively long, with 42 items.

Daily Coping Inventory

Stone and Neale (1984) developed a new measure of coping with daily problems (the Daily Coping Inventory), which initially consisted of 87 items across ten categories. This was later shortened to a 55-item checklist across eight categories due to the low alpha coefficients that were found in their preliminary study. This measure was tested using a small general population sample (n = 78), revealing that the alpha coefficients were still relatively poor (average alpha = 0.57). Stone and Neale (1984) concluded that different coping items can serve different functions for different people (e.g. a strategy used for relaxation by one person might be used for distraction by another), and that this could explain the low alpha values observed. Following this, Stone and Neale (1984) adapted their Daily Coping Inventory, creating an open-ended assessment measure. This presents one-sentence descriptions of the eight coping categories and asks respondents to report if they did or thought anything that would fit into the categories. If a positive response is given, they must then provide a detailed description of the strategies they have used. This measure was again tested using a general population sample (n = 120). Good inter-rater reliability was reported between two researchers (kappa = 0.74), and content validity was also demonstrated. However, internal reliability could not be reported, because the eight coping categories were assessed with a simple ‘yes/no’ response (and an elaboration of the strategies used if a ‘yes’ response was given) rather than a scale consisting of several items. Stone and Neale (1984) acknowledged the potential weaknesses of their measure, stating that it is not fully valid and that: “Evidence that supports the validity of the measure is, in some respects, circumstantial” (pg 905). The Daily Coping

Inventory has been utilised in some research studies, but many of these choose to use a modified version tailored specifically for use in their particular research study, often adding additional coping categories and rating scales (Gunthert et al, 2007; Gunthert et al, 1999). This indicates that general confidence in the measure's validity is low, suggesting that use of an alternative coping measure is advisable. In addition, the Daily Coping Inventory is a generic coping measure whose predictive validity has not been tested in pain populations. This represents another weakness of the measure in the context of this thesis, as a pain-specific coping measure is desirable here.

5.1.3. Pain-specific coping measures

This section explores three pain-specific cognitive coping measures, the Vanderbilt Pain Management Inventory (Brown and Nicassio, 1987), the Chronic Pain Coping Inventory (Jensen et al, 1995), and the Coping Strategies Questionnaire (Rosenstiel and Keefe, 1983). These particular measures have been selected for examination due to their popularity within the pain coping literature and frequent use within research studies and clinical practice.

Vanderbilt Pain Management Inventory

The Vanderbilt Pain Management Inventory (VPMI) was developed by Brown and Nicassio (1987) to assess the coping strategies used by chronic pain patients in the management of moderate to severe pain episodes (see Appendix 2, pg. 408). A sample of rheumatoid arthritis patients (n = 361) with a mean age of 53 years

was used to develop the measure. Brown and Nicassio (1987) used exploratory factor analysis on a random sample of 259 participants to explore the factor structure of their scale, and then used the remaining participants to confirm the initial factor structure. These factor analytic techniques resulted in the identification of two coping categories – active and passive coping – consisting of 7 and 11 items, respectively. These active and passive coping scales were found to be internally consistent (alpha = 0.71 and 0.82, respectively), and slightly negatively correlated (r = -0.29). The active and passive coping scales were also found to be stable over a six-month period (r = 0.65 and 0.69, respectively), and evidence for their concurrent and predictive validity was presented. Brown and Nicassio (1987) stated that the coping scales of the VPMI are: “brief, easily administered, and appear to be useful for both clinical and research purposes” (pg. 62). The array of studies to utilise the VPMI across a range of patient populations, such as rheumatoid arthritis patients, cancer patients, and patients with chronic pain in various sites including low back pain (Covic et al, 2000; Mercado et al, 2005; Ramirez-Maestre et al, 2008; Rodriguez Parra et al, 2000; Storheim and Bo, 2000) appear to support this statement. However, there are several problems with the measure. Firstly, relative to passive coping, the predictive role of active coping on pain and disability appears to be far less conclusive. For example, Ramirez-Maestre et al (2008) found that higher levels of passive coping were associated with lower levels of functioning, and higher levels of pain intensity and impairment. However, they also reported that the associations between active coping and these pain and disability variables were quite low. They commented that although the role of passive strategies is clear in terms of their association with pain and disability variables, “the role of active coping is not clear at all” (pg 754). This was

also supported by the findings of the systematic review that was conducted as part of this thesis (see Chapter 2). This review showed passive coping to be a potential predictor of low back pain outcome, but active coping was not shown to be significantly predictive. In addition, Mercado et al (2005) noted the apparent inconsistencies in the literature with regard to active coping, stating that some studies reveal no significant associations with active coping, some reveal associations with positive measures of outcome, and others reveal associations with negative measures. They speculated that these inconsistencies might be due to the diverse nature of strategies encompassed within the active coping scale.

A further problem with the VPMI was highlighted by Snow-Turek et al (1996). They reported that the psychometric properties of the VPMI appear to be inferior to those of the Coping Strategies Questionnaire (see below). They argued that the Coping Strategies Questionnaire (CSQ) has been used in a multitude of investigations with its reliability and validity having been thoroughly examined, whereas the validity of the VPMI coping dimensions might be obscured by the psychometric limitations of the measure. They highlight the problems with the active coping scale (mentioned above) and conclude that this does not provide adequate evidence for the scale's concurrent validity. They state that: "Few studies have examined the psychometric qualities of the VPMI, and the findings of these studies have been mixed. In contrast, there is extensive favourable literature on the psychometrics of the CSQ" (pg 456). Snow-Turek et al (1996) then undertook a comparative analysis of the two coping measures (VPMI and CSQ), revealing significantly higher internal consistency for the CSQ than the VPMI, along with support for the CSQ's convergent, criterion, and construct validity. Their findings did not support the validity of the VPMI active coping scale. Snow-Turek

et al (1996) concluded that the clinician or researcher should carefully consider these findings when choosing a coping measure, advising that the problems with the VPMI should be weighed-up against the benefits of using the measure (i.e. its shorter length, which might lead to higher completion rates particularly with uncooperative or severely impaired chronic pain patients). However, despite these benefits, the above criticisms could be indicative of why most current low back pain research studies have moved towards using the CSQ as a measure of coping, rather than the VPMI.

Chronic Pain Coping Inventory

The Chronic Pain Coping Inventory (CPCI) is a 65-item coping measure, developed by Jensen et al (1995) (see Appendix 2, pg. 409). A convenience sample of 176 chronic pain patients with a mean age of 47 years was used in the development of this measure. Only 25% of the sample were low back pain patients, with the remainder suffering from pain in the leg, head, neck, shoulder/arm, abdomen, upper back, anal/genital region, or in multiple primary sites. Scale analysis revealed eight internally consistent coping scales with alpha values greater than 0.70 (guarding, resting, asking for assistance, relaxation, task persistence, exercise/stretch, coping self-statements, seeking social support), and three scales measuring medication use (opioid, nonsteroidal anti-inflammatory drugs, sedative-hypnotic). Adequate test-retest reliability was reported for all scales ($r \geq 0.66$).

A cross-validation study was then performed on a second sample of chronic pain patients (n = 78) with a mean age of 42 years and their 'significant other' (usually a

spouse or partner), who also completed the study measures. Internal consistency of the scales was found to be good for both the patient and the significant other versions (alpha $\geq$ 0.74), and similarities were reported between the two versions in relation to measures of adjustment, thereby supporting the validity of the measure. Jensen et al (1995) also found that eight out of the nine statistically significant relationships were in the predicted direction, thus further demonstrating support for the validity of the CPCI. In addition, DeGood and Tait (2001) reported that several of the scales have been found to be associated with either poor (guarding, resting, asking for assistance) or good (task persistence) adjustment. The CPCI has been utilised by several research studies in recent years across a variety of pain patient populations (Ersek et al, 2008; Jensen et al, 2007; Turner et al, 2005). Research has also been conducted specifically to examine the measure's reliability and validity in pain populations, providing support for the internal consistency of the scales, the factor construction of the measure (eight-factor model), as well as its predictive validity, as indicated by the scales' association with measures of adjustment (Ektor-Andersen et al, 2002; Hadjistavropoulos et al, 1999; Tan et al, 2005; Truchon et al, 2006). However, in Jensen et al's (1995) original study, several of the coping scales only demonstrated weak or inconsistent relationships to measures of functioning in the two samples, and Jensen et al (1995) did comment that the CPCI is not a comprehensive measure of coping, recommending that the CSQ be used if a measure of other cognitive coping dimensions is desired.

A further limitation of the CPCI is its lack of operational ease of use. Due to its considerable length (65 items), completion of the CPCI places increased assessment burden on patients and researchers alike. This problem has been

highlighted by Romano et al (2003) who reported on the development of a shorter (42-item) version of the CPCI (CPCI-42). They found very high correlations between the original and the abbreviated scales, as well as comparable internal consistency, reliability, and validity. This development is encouraging, and the CPCI-42 has subsequently been utilised in a chronic pain population (Ersek et al, 2006). This study provided further validation of the measure, showing strong associations between the two versions of the CPCI ($r = 0.94$ to 0.98, $p<0.0001$), and acceptable internal consistency of the 42-item version (alpha ≥ 0.64). However, although this shorter version marks a definite improvement in assessment burden, a 42-item measure still places quite a considerable burden upon respondents, and researchers might still be reluctant to utilise the measure for this reason.

Coping Strategies Questionnaire

The Coping Strategies Questionnaire (CSQ) was developed by Rosenstiel and Keefe (1983) and has become the most widely used measure of pain coping strategies in both research and clinical practice, having formed the backbone of research on coping and adjustment to pain (DeGood and Tait, 2001) (see Appendix 2, pg. 413). The original CSQ consists of 42 items measuring six different cognitive coping subscales (diverting attention, reinterpreting pain, coping self-statements, ignoring pain, praying or hoping, catastrophizing), and one behavioural coping subscale (increasing activity), with two additional items measuring pain self-efficacy (ability to control and decrease pain). Items for each subscale are rated as to the frequency with which they are used on a scale from 0

(never) to 6 (always). Rosenstiel and Keefe (1983) utilised a small chronic low back pain population (n = 61) in the development of the CSQ, therefore providing a condition-specific measure of coping with low back pain and subsequently, a "more focused assessment of how patients cope with pain" (Weickgenant et al, 1993, pg 98). Patients in the sample used to develop the CSQ (Rosenstiel and Keefe, 1983) had a mean age of 43 years and had experienced pain for at least six months. The subscales were found to be internally reliable, achieving alpha values of at least 0.71, a finding that was also later supported by Lefebvre et al (1995). Evidence was presented for the predictive validity of the measure, showing that the coping strategies explained a significant proportion of the variance over and above patient history variables and somatization, in the prediction of average pain, depression, state anxiety, and functional capacity (change in R^2 was between 11% and 22%). Rosenstiel and Keefe (1983) stated that: "patient history variables and somatization are strongly related to adjustment to chronic pain. Even when the impact of these variables on adjustment is controlled for statistically, coping strategies are found to be highly predictive of adjustment" (pg 41). They also looked at the proportion of total variance explained by the coping strategies, reporting this to be between 19% and 61% for the four adjustment measures. In addition to this, support for the test-retest reliability of the items and the subscales has been documented over a period of 24 hours (Main and Waddell, 1992). The CSQ's focus on specific coping skills and validation in a chronic low back pain population allows for a more detailed examination of the role of specific coping strategies in the course of low back pain. However, the assessment burden that the original measure entails (due to its considerable length of 42 items) might present a problem for researchers and clinicians who wish to use the CSQ.

Despite these concerns, it has been used extensively (Lopez-Lopez et al, 2008; Sanchez et al, 2009) and is reported to be the single instrument of most value in clinical settings due to its substantial support in the clinical literature (DeGood and Tait, 2001). The following section summarises more recent research focusing on the factor structure of the CSQ and the development and utility of composite CSQ measures.

Several researchers have performed factor analytic studies of the CSQ, to determine whether the factor structure can be replicated in different samples. One of the earliest of these studies was published by Lawson et al (1990), identifying a three-factor solution through the use of confirmatory factor analysis (CFA) on a sample of 620 chronic pain patients. They labelled their identified factors as 'conscious use of cognitive coping strategies' (with high loadings on ignoring pain, and coping self-statements), 'self-efficacy beliefs' (with high loadings on ability to control and decrease pain), and 'avoidance of pain' (with high loadings on diverting attention, and praying or hoping). However, the catastrophizing and increasing activity subscales from the original CSQ did not load onto any of these factors. A second composite measure was proposed by Tuttle et al (1991), whose exploratory factor analysis using a sample of chronic pain patients (n = 181) yielded results closely matching those of the original CSQ. They identified a five-factor solution, supporting all of the CSQ cognitive coping strategy subscales apart from 'coping self-statements'. Therefore, this study appeared to provide support for the construct validity of the CSQ. In addition to this, Robinson et al's (1997) study (also utilising a chronic pain patient sample, n = 965) initially identified a nine-factor solution, however after the removal of factors with unacceptable

internal consistency, they revealed a six-factor solution, supporting all of the original CSQ cognitive coping subscales.

Despite some studies showing support for the original structure of the CSQ, the results of further factor analytic studies were varied. For example, Jensen et al (1992) identified a two-factor solution amongst a sample of chronic pain patients (n = 141): 'coping attempts' (with high loadings on ignoring pain, diverting attention, coping self-statements, increasing activity, and reinterpreting pain), and 'helplessness' (with high loadings on ability to control and decrease pain, catastrophizing, and praying or hoping). Dozois et al (1996) identified a three-factor solution amongst a sample of chronic low back pain patients (n = 200): 'cognitive coping and suppression' (with high loadings on ignoring pain, coping self-statements, and reinterpreting pain), 'pain control and rational thinking' (with high loadings on ability to control and decrease pain, and catastrophizing), and 'helplessness/emotion-focused coping' (with high loadings on praying or hoping, increasing pain behaviour, increasing activity, diverting attention, and catastrophizing). The array of inconsistent results reported from factor analytic studies of the CSQ suggest that the measure is not optimal for use in future studies. This concern was also highlighted by Tuttle et al (1991) who reported that their results: "seriously call into question the validity of using the CSQ as reported in the literature" (pg 185).

In response to the inconsistent findings of factor analytic studies, Riley and Robinson (1997) compared all prior published factor solutions using CFA. Their final model retained only 27 of the original 42 items across the following six subscales: 'distraction', 'catastrophizing', 'ignoring pain', 'distancing from pain', 'coping self-statements', and 'praying'. Riley and Robinson (1997) called this new

composite measure the ‘Coping Strategy Questionnaire-Revised’ (CSQ-R), and they reported several conclusions from their comprehensive analysis, including the observation that the catastrophizing factor is the most robust across all studies, and that the distraction factor appears to replicate across most studies. They also concluded that coping self-statements and ignoring pain are highly associated and will emerge as separate factors only across very large samples. The CSQ-R has been utilised and supported as a measure of pain coping by several studies since its publication (Anie et al, 2002; Hastie et al, 2004; Riley et al, 1999), and Utne et al (2009) found the factor structure of the CSQ-R to fit both their inpatient and outpatient data well, recommending the use of the measure in research and as a clinical instrument. However, their sample consisted of oncology pain patients and therefore may not be generalisable to patients with non-cancer pain.

Harland and Georgieff (2003) reported on the development of a new measure derived from the CSQ, the CSQ-24 (see Appendix 1, pg. 372). Their aim in developing this measure was to re-examine the factor structure of the CSQ and produce a more valid and user-friendly version of the tool. They argued that the current length of the CSQ makes its inclusion within a questionnaire battery problematic, thus the development of a shorter version, which would inevitably take less time to complete and score, would significantly increase its clinical utility.

Harland and Georgieff (2003) utilised a British secondary care chronic low back pain population (n = 214) for their study, stating that this provides: “a comprehensive structural analysis of the CSQ using a population significantly culturally different from the American populations that have thus far predominantly been used” (pg.297). The resulting structure consisted of four factors with acceptable alpha values ($a \geq 0.75$). Factor one replicated the original

catastrophizing subscale and therefore retained this label. Factor two consisted of four items from the diverting attention subscale and two from the increasing activity subscale, and was labelled ‘diversion’. Factor three closely resembled the original reinterpreting pain subscale, with five items from this subscale being retained, along with one item from the ignoring pain subscale. This factor therefore was labelled ‘reinterpretation’. Factor four consisted of four items from the coping self-statements subscale and one from the ignoring pain subscale, and was labelled ‘cognitive coping’. This new measure, consisting of the above four factors, comprised a total of 23 items[1], therefore achieving the initial aim to develop a shorter version of the CSQ.

Harland and Georgieff (2003) also provided evidence for the construct validity of the CSQ-24, describing its relationship to measures of pain, disability, anxiety, and depression. They reported that the catastrophizing subscale was positively related to these measures, and the diversion subscale was positively related to disability and anxiety. The cognitive coping subscale was reported to be negatively related to disability and depression, and the reinterpretation subscale was not significantly related to any of these measures (thus replicating the findings of Robinson et al, 1997). This finding does not support the predictive validity of the reinterpretation subscale, therefore highlighting a potential problem with the psychometric properties of the CSQ-24. The relationships that were found by Harland and Georgieff (2003) showed that measures of poor functioning were associated with the use of maladaptive coping strategies (e.g. catastrophizing) and inversely associated with the use of adaptive strategies (e.g. cognitive coping). The direction

[1] The CSQ-24 was given its name due to the measure initially consisting of 24 items. However, one item (measuring patients’ self-efficacy with regards to their ability to control pain) is often dropped from the measure as it is a single item (i.e. it does not contribute to the assessment of coping strategies via the four identified subscales).

of these relationships was broadly in agreement with previous studies (Robinson et al, 1997; Tuttle et al, 1991), therefore providing preliminary support for the reliability and validity of this new version of the CSQ. Harland and Georgieff (2003) stated that: “The results of this study support the use of the CSQ-24 as a stable assessment tool in chronic low back pain populations” (pg.299). They also stated that the similarity of their results to those of previous CSQ studies demonstrated further support for the measure’s stability, particularly due to their use of a culturally different population. However they did recognize that their sample size (n = 214) was relatively small, advising that further confirmatory analysis of their measure in a similar population would be beneficial. As yet, researchers in the chronic pain field have failed to fully address this recommendation. However, Chan et al (2007) did perform a CFA of the CSQ-24 using an American sample of individuals with chronic musculoskeletal pain. They found that the CSQ-24 model of pain coping strategies did not fit their data well. Through a subsequent exploratory analysis, they found that several items loaded onto multiple factors. This indicates that the CSQ-24 may not be a robust measure, but there may be several explanations of the results of the Chan et al (2007) study. Firstly, they used an American population of chronic musculoskeletal pain patients, whereas Harland and Georgieff (2003) used a British chronic low back pain population in the development of the CSQ-24. These differences could have affected the results found (i.e. culturally different populations with different pain sites might require different measurement tools to accurately assess their coping strategy use). A second limitation is the small sample size used by Chan et al (2007). They initially performed a sample size calculation, revealing a minimum sample size of 230 to 460 participants. However, the sample that was actually used fell way below these

parameters (n = 171), indicating low statistical power. This sample size was also lower than that of Harland and Georgieff's (2003) original study, in which they used 214 patients (a sample they believed to be relatively small) and reported that researchers should repeat their analyses using larger samples. Therefore, the results of Chan et al's (2007) study should not deter researchers from using the CSQ-24, as the limitations of this study could explain the results. Further CFA of the CSQ-24 should be undertaken to provide a more accurate picture before any judgement of the measure's psychometric properties can be made.

In their review and critique of assessment instruments for patients with persistent pain, Grimmer-Somers et al (2009) examined the CSQ, the CSQ-R, and the CSQ-24. They reported that all three versions have similarly strong internal consistency, and strong concurrent and divergent validity, however the CSQ and the CSQ-R are lengthy and may not be suitable for some persistent pain patients or those with low literacy. Therefore, they concluded that the CSQ-24 appears to be the most appropriate for clinical use. There have also been recent attempts by researchers to shorten the CSQ further. For example, Jensen et al (2003) attempted to develop a version of the CSQ that consisted of either one or two items assessing each subscale. However, there were several limitations associated with these measures, including lower scale reliability, limited content validity, and unknown test stability. Jensen et al (2003) commented that: "the limitations of one- and two-item measures suggest some need for caution in their use" (pg 463), therefore although these brief measures can reduce assessment burden for study participants, they do not appear to be superior to the CSQ-24. With much research to date showing the CSQ to be the preferred measure of coping strategies amongst chronic low back pain patients, and with recent reviews (see Grimmer-

Somers et al, 2009) advising the use of the shorter, 23-item version of this measure, the CSQ-24 was thought to be the most appropriate measure of coping and was subsequently selected for use in the BeBack study.

Although many studies continue to use the original CSQ as a measure of pain coping, there has been a paucity of research investigating pain coping using the CSQ-24. This could potentially be due to a lack of further investigation of the factor structure of this relatively new measure. In their examination of the CSQ and the CSQ-R, Hastie et al (2004) highlighted the lack of attention given to the CSQ-24, stating that given the extensive use of the CSQ, as well as the concerns and apparent variability of its factor structure in different populations (see Tuttle et al, 1991, above), it is important to test the factor structure of newer versions. The remainder of this chapter aims to address these issues through an examination of the factor structure of the CSQ-24 using confirmatory factor analysis, in order to determine the suitability of the CSQ-24 for use in the analysis of coping in the remaining chapters of this thesis.

5.2. Confirmatory factor analysis of the CSQ-24

5.2.1. Why use CFA?

CFA is a statistical technique used to confirm a previously reported structure underlying a set of variables (see Chapter 4). Given that the measure of coping strategies used within the BeBack dataset (the CSQ-24) is an established, validated, and tested measure, the analysis reported here is confirmatory in nature, attempting to confirm the already publicised structure of the CSQ-24 (see

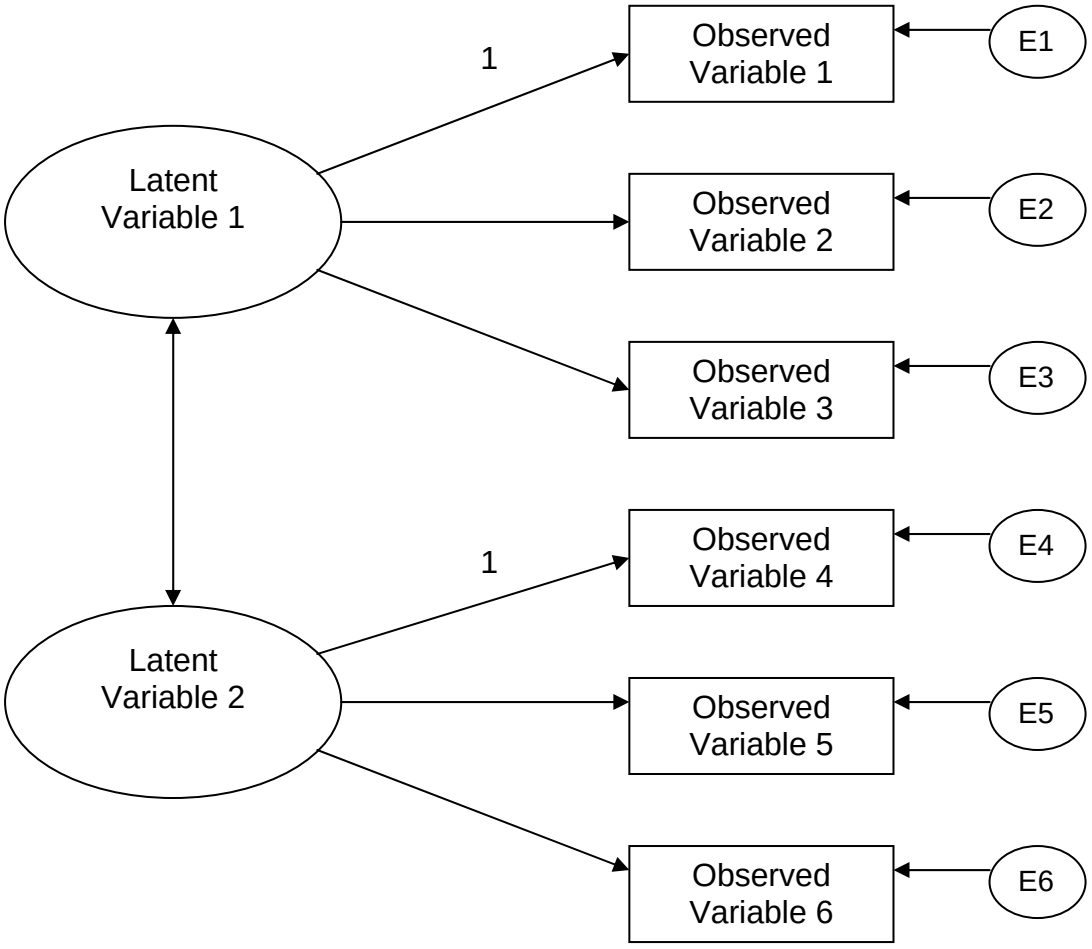
Appendix 1, pg. 372) within the BeBack dataset, in order to determine whether the measure with the structure already identified is appropriate for further use on the dataset within this thesis. Therefore, CFA was selected as the most appropriate analytical approach.

5.2.2. The CFA model

Figure 5.1 depicts a basic CFA model. A statistical software programme called AMOS is used to create the CFA model, thereby standardising its design and features. As shown in figure 5.1, the observed variables (e.g. the measure's individual scale items) are represented by rectangles, and the latent variables (e.g. the measure's suggested subscales) are represented by ovals. Arrows are drawn from the latent variables to the observed variables, linking the items with the subscales to which they supposedly 'belong'. Double headed arrows link the latent variables together, representing some degree of correlation between these variables. Linked to each observed variable in the model is a small circle representing its measurement error (e.g. E1, E2.etc.).

In a CFA model, 'scaling' refers to setting the variance equal to one (represented in figure 5.1 as a number one next to the path from each latent variable to one observed variable). This operation is easily performed in AMOS and ensures that the CFA model is overidentified (i.e. there are less unknown parameters than there are known ones, making it possible to find unique estimates for each parameter). In a CFA model, it is necessary for the latent variables to be 'scaled' in order to test the fit of the model (Harrington, 2009). As these variables are unobserved, it is

Figure 5.1: A basic CFA model (Harrington, 2009)



necessary to set their unit of measurement due to the lack of a pre-defined unit of measurement.

The objective of CFA is to test whether the model fits the data by obtaining estimates for each parameter of the model, and there are several estimation methods in AMOS that can be used in order to do this. These include, but are not limited to, Maximum Likelihood (ML), Generalized Least Squares (GLS), and Unweighted Least Squares (ULS). Maximum Likelihood (ML) is perceived to be more useful than GLS and ULS, and is therefore the most commonly used method (Harrington, 2009). Brown (2006) stated that ML: “aims to find the parameter

values that make the observed data most likely" (pg 73). All of the alternative estimation methods in AMOS have their limitations (for example, if there are missing data, none of the alternative estimation methods can be used, therefore ML is the only method available where there are missing data), thus explaining the more frequent use of the ML method. However, there are several assumptions that must be met in order to use ML. Firstly, a large sample size is required. There are no strict guidelines as to what constitutes a large enough sample, however a general rule of thumb proposed by Kline (2005) is that less than 100 is considered to be a small sample, 100 to 200 is medium, and may be acceptable in simple model studies, and greater than 200 is large. Muthen and Muthen (2002) also identified possible sample size guidelines through the reporting of their own CFA study. They used Mplus (an alternative software programme) to identify the appropriate sample size for their study. They reported that a minimum sample size of 150 was needed for normally distributed and complete data, with this figure rising to 315 for non-normal and incomplete data.

A second assumption that must be met in order to use ML is that the variables must have continuous levels of measurement. Regarding the use of Likert-type response options, Raykov and Marcoulides (2006) stated that where there are only a few response options, the use of this data can lead to biased results. Likert-type response data should only be used when there are at least five response categories (Cohen et al, 2003). The final assumption that must be met in order to use ML is that the data must be normally distributed. This is easily tested, using SPSS to reveal skewness and kurtosis values for the data (see Chapter 3 for more detail on skewness and kurtosis), with significant values indicating a non-normal

distribution. Skewness values greater than 3.0 are problematic (indicative of a non-normal distribution), as are kurtosis values greater than 20.0 (Kline, 2005).

5.2.3. Model fit

There are several goodness-of-fit indices that are produced by AMOS following its analysis of the model. These all provide different information, therefore researchers typically report more than one of these fit indices when attempting to evaluate model fit. The first, and most commonly used fit index is the chi-square statistic. This tests whether the model fits exactly in the population, with a non-significant result indicating good model fit. Despite its frequent use, the chi-square statistic is particularly sensitive to sample size and will almost always be significant with large samples (Harrington, 2009). Therefore, other fit indices should also be reported when assessing model fit. Martens (2005) recommended using the Comparative Fit Index (CFI) and the Root Mean Square Error of Approximation (RMSEA) as the primary goodness-of-fit indices, and this recommendation has been supported by other researchers through their use of these indices within research studies (Kline, 2005; Roddy et al, 2009). Chan et al (2007) stated that for model fit to be acceptable, the CFI value must be greater than 0.95. They also stated that an RMSEA value below 0.05 indicates a close fit, a value of 0.05 to 0.08 indicates a fair fit, a value of 0.08 to 0.10 indicates a mediocre fit, and a value of greater than 0.10 indicates a poor fit. These fit indices should all be considered when an evaluation of model fit is made.

5.2.4. Testing key assumptions

Before performing the CFA, assessment of the BeBack cohort dataset was necessary to ensure that the key assumptions were met in order to use the ML estimation method.

The BeBack cohort consisted of 1,591 participants at baseline, therefore far exceeding the minimum for a large sample as suggested by Kline (2005) to be 200 cases, and by Muthen and Muthen (2002) to be 315 cases.

According to Cohen et al (2003), Likert-type response data may be used if there are at least five response categories. The CSQ-24 utilises a Likert-type response scale from 0 (never) to 6 (always), therefore comprising seven response categories. As this exceeds the minimum of five response categories, the second key assumption for using ML was adequately met.

The final assumption states that the data to be used must be normally distributed. Skewness values for the individual CSQ-24 items ranged from –1.29 to –2.97, thus all falling below the maximum of 3.0. Kurtosis values for the items ranged from 5.46 to 13.52, thus again falling below the maximum of 20.0. Therefore, the distribution of the CSQ-24 data for the BeBack cohort can be assumed to be normal and therefore unproblematic with regards to performing a CFA on this data.

5.2.5. Results of the CFA

Figure 5.2 shows the CFA model that was entered into the AMOS software programme. Figure 5.2 shows the four previously suggested CSQ-24 subscales

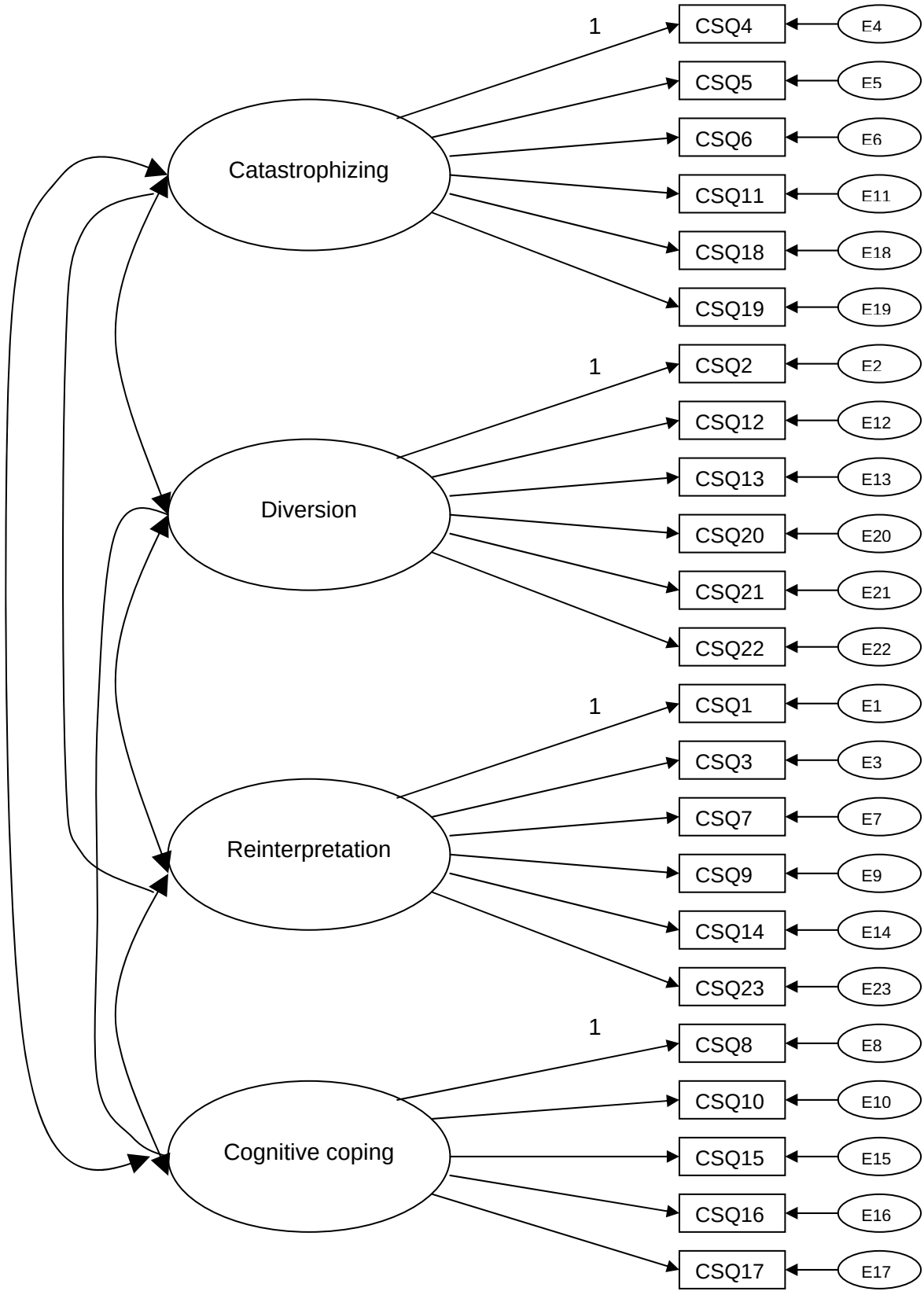
(catastrophizing, diversion, reinterpretation, cognitive coping) represented by ovals. These are the latent, or unobserved variables in the model. The individual scale items are the observed variables here and are represented by rectangles. Arrows point from each subscale to the items that comprise that subscale (i.e. the catastrophizing subscale is comprised of items 4, 5, 6, 11, 18, and 19). There is also a small circle linked to each observed variable to represent its measurement error (e.g. E4, E5.etc.). Once entered into AMOS, this model was used to run the CFA in order to determine whether or not the model fit the BeBack dataset. Goodness-of-fit statistics were computed and those recommended for use in CFA by Martens (2005) are reported in table 5.1.

Table 5.1: Goodness-of-fit statistics

Fit statistic	Value	Model fit to data
Chi-square	2656.51 (p<0.001)	No fit
CFI	0.85	No fit
RMSEA	0.08	Mediocre fit

Table 5.1 shows that the chi-square value was statistically significant, indicating that the model does not fit the data well. However, a statistically significant chi-square value was to be expected due to the very large sample size used (Harrington, 2009). Table 5.1 shows a CFI value of 0.85, which falls below the minimum of 0.95 for good model fit. Table 5.1 also shows a RMSEA value of 0.08, indicating mediocre model fit. Taken together, the goodness-of-fit statistics show only very weak evidence to suggest that the CSQ-24 model as suggested in previous literature (Harland and Georgieff, 2003) fitted the BeBack cohort data. Therefore, it appears that the use of the CSQ-24 in its current form within the

Figure 5.2: CFA model of the CSQ-24



dataset utilised by this thesis (BeBack) is not supported here. Thus, it is necessary to undertake further exploratory analysis to determine the most appropriate factor structure for use here. The following section describes this exploratory analysis.

5.3. Exploratory factor analysis of the CSQ-24 (Sample A)

As the CFA outlined above did not adequately confirm the factor structure of the CSQ-24, it was deemed appropriate to use exploratory factor analysis (EFA) in order to determine whether another factor structure was more appropriate. EFA identifies the optimum factor structure for a measurement tool within a particular sample, and therefore should help to identify the best possible way in which to utilise the CSQ-24 within the remaining chapters of this thesis. The baseline BeBack questionnaire data were used for the EFA. The dataset was randomly split (approximately 50-50) to enable the first half of the data (Sample A) to be used for the EFA and the second half of the data (Sample B) to be used for a CFA to see if the identified structure could be confirmed.

5.3.1. Methods – split half EFA

Sample A consisted of 825 participants, therefore exceeding the suggested minimum of 300 cases for EFA (Tabachnick and Fidell, 2007). Bartlett's test of sphericity and the KMO measure of sampling adequacy were performed to ensure that the data were suitable for EFA.

The 23 items from the CSQ-24 were factor analysed using principal axis factoring with the oblique method of rotation (direct oblimin rotation). Kaiser's criterion was used to determine the number of factors to be extracted.

5.3.2. Results of the split half EFA

The dataset (Sample A) produced a highly significant Bartlett's test ($p<0.001$) and a KMO value of 0.936, therefore confirming that EFA was appropriate for use on the CSQ-24 items. Table 5.2 shows the total variance explained by the factors. Using Kaiser's criterion to determine the number of factors to extract, it is evident that four factors have eigenvalues above 1, and these four factors explain a total of 63.96% of the variance. The pattern matrix table (see table 5.3) shows the rotated four-factor solution, with the loading scores for each item on the four factors. Factor loadings above 0.3 are highlighted in bold. In brackets next to each CSQ-24 item is the subscale to which that item should belong, according to the original structure proposed by Harland and Georgieff (2003) (see Appendix 1, pg. 372). Table 5.3 shows that 22 out of the 23 items load onto the factors that they should belong to, according to the original CSQ-24 structure proposed by Harland and Georgieff (2003). Factor one represents the diversion factor, factor two represents catastrophizing, factor three represents cognitive coping, and factor four represents reinterpretation. Only one item (item 9) does not load uniquely onto the expected factor. According to the original CSQ-24 structure, item 9 should belong to the reinterpretation factor. Although item 9 does load onto this factor (factor loading = 0.32), it also loads more strongly onto the cognitive coping factor

Table 5.2: Total variance explained by the extracted factors

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	9.72	42.24	42.24	9.29	40.38	40.38	7.00
2	2.52	10.96	53.20	2.12	9.21	49.59	6.10
3	1.33	5.76	58.96	0.91	3.95	53.54	5.93
4	1.15	5.00	63.96	0.71	3.07	56.61	5.95
5	0.86	3.73	67.68				
6	0.80	3.50	71.18				
7	0.64	2.77	73.95				
8	0.60	2.61	76.56				
9	0.55	2.40	78.95				
10	0.48	2.09	81.04				
11	0.46	2.01	83.05				
12	0.45	1.95	85.00				
13	0.41	1.80	86.80				
14	0.40	1.74	88.54				
15	0.38	1.67	90.21				
16	0.37	1.60	91.81				
17	0.35	1.51	93.32				
18	0.32	1.38	94.70				
19	0.29	1.24	95.94				
20	0.27	1.19	97.13				
21	0.24	1.06	98.19				
22	0.22	0.95	99.14				
23	0.20	0.86	100.00				

(factor loading = 0.42), therefore it is cross-loading and should be treated with caution.

Overall, the results of this EFA indicate strong support for the original structure of the CSQ-24 within the BeBack patient cohort. In order to confirm these exploratory findings, CFA will be performed on the second half of the BeBack dataset (Sample B).

5.4. Confirmatory factor analysis of the CSQ-24 (Sample B)

The EFA on Sample A above supported the original structure of the CSQ-24, with just one item (item 9) causing concern due to cross-loading. This item loaded onto

Table 5.3: Pattern matrix showing factor loadings for a four-factor solution

Items	Factor			
	1	2	3	4
CSQ 13 (DIV)	**0.80**	-0.00	-0.03	0.02
CSQ 20 (DIV)	**0.66**	0.00	0.07	0.07
CSQ 12 (DIV)	**0.63**	0.14	-0.07	0.14
CSQ 2 (DIV)	**0.60**	0.02	0.03	0.21
CSQ 21 (DIV)	**0.53**	0.16	0.19	0.01
CSQ 22 (DIV)	**0.51**	0.09	0.23	-0.01
CSQ 4 (CAT)	0.08	**0.83**	0.02	-0.14
CSQ 18 (CAT)	0.01	**0.77**	-0.04	0.03
CSQ 5 (CAT)	0.09	**0.76**	-0.09	0.01
CSQ 11 (CAT)	0.13	**0.72**	0.02	-0.09
CSQ 19 (CAT)	-0.06	**0.70**	0.08	0.16
CSQ 6 (CAT)	-0.13	**0.63**	0.07	0.19
CSQ 15 (CC)	-0.12	0.03	**0.86**	0.05
CSQ 10 (CC)	0.11	-0.05	**0.70**	-0.02
CSQ 17 (CC)	0.07	0.10	**0.70**	-0.15
CSQ 16 (CC)	0.11	-0.12	**0.70**	0.11
CSQ 8 (CC)	0.02	0.06	**0.57**	0.19
CSQ 9 (RE)	0.00	0.05	**0.42**	**0.32**
CSQ 23 (RE)	0.12	0.11	0.10	**0.64**
CSQ 7 (RE)	0.06	0.10	-0.01	**0.63**
CSQ 14 (RE)	0.19	0.07	-0.00	**0.62**
CSQ 1 (RE)	0.15	0.03	0.12	**0.52**
CSQ 3 (RE)	0.18	-0.01	0.18	**0.36**

* (DIV) = Diversion subscale, (CAT) = Catastrophizing subscale, (CC) = Cognitive coping subscale, (RE) = Reinterpretation subscale

both the reinterpretation and the cognitive coping subscales, therefore two separate CFAs were performed to further investigate the positioning of this item within the measure. Firstly, item 9 was specified as a reinterpretation item and the CFA was performed (Model X). Then item 9 was re-specified as a cognitive coping item and the CFA was performed again (Model Y).

5.4.1. Methods – split half CFA

This CFA was performed on the second half of the BeBack questionnaire data (Sample B), which consisted of 766 participants. This sample therefore far exceeded the assumption for the minimum number of participants necessary for CFA (see section 5.2.2.).

5.4.2. Results of the split half CFA

Goodness-of-fit statistics were computed for both CFA models (X and Y) and are reported in table 5.4.

Table 5.4: Goodness-of-fit statistics

Fit statistic	Value	Model fit to data
Chi-square	Model X = 1448.24 ($p<0.001$) Model Y = 1406.43 ($p<0.001$)	Model X = No fit Model Y = No fit
CFI	Model X = 0.85 Model Y = 0.85	Model X = No fit Model Y = No fit
RMSEA	Model X = 0.09 Model Y = 0.08	Model X = Mediocre fit Model Y = Mediocre fit

Table 5.4 shows that the two models (X and Y) produced very similar goodness-of-fit statistics. The chi-square values were significant and the CFI values fell below the minimum of 0.95, therefore suggesting that the model does not fit the data well. The RMSEA values indicated only mediocre fit, therefore the overall evidence for model fit here is weak.

Due to the very similar results reported for model X and model Y here, it can be concluded that the positioning of item 9 (either on the reinterpretation or the cognitive coping subscale) within the CSQ-24 does not greatly affect the structure of the measure or the extent to which the model fits the data in this case. It was therefore decided to keep the position of this item on the subscale suggested by the original CSQ-24 structure (the reinterpretation subscale).

As the CFA did not show support for the model that was identified as optimal from the EFA here, further EFA utilising the whole sample was felt to be necessary. The following section reports on the results of this EFA.

5.5. Exploratory factor analysis of the CSQ-24 (whole sample)

EFA was conducted using the whole BeBack sample in an attempt to clarify the optimal factor structure of the CSQ-24 within this patient cohort.

5.5.1. Methods – whole sample EFA

This EFA was performed on the whole BeBack sample (n = 1,591). This sample is particularly large and far exceeds the suggested minimum of 300 cases for EFA (Tabachnick and Fidell, 2007). Bartlett's test of sphericity and the KMO measure of sampling adequacy were performed to ensure that the data was suitable for EFA.

The CSQ-24 items were factor analysed using principal axis factoring with the oblique method of rotation (direct oblimin rotation). Kaiser's criterion was used to determine the number of factors to be extracted.

5.5.2. Results of the whole sample EFA

The dataset produced a highly significant Bartlett's test ($p<0.001$) and a KMO value of 0.953, therefore confirming that EFA was appropriate for use on the CSQ-24 items. Table 5.5 shows the total variance explained by the factors. Using Kaiser's criterion to determine the number of factors to extract, it is evident that four factors have eigenvalues above 1, and these four factors explain a total of 65.88% of the variance. The pattern matrix table (see table 5.6) shows the rotated four-factor solution, with the loading scores for each item on the four factors. Factor loadings above 0.3 are highlighted in bold. In brackets next to each CSQ-24 item is the subscale to which that item should belong, according to the original structure proposed by Harland and Georgieff (2003). Table 5.6 shows that 21 out of the 23 items load onto the factors that they should belong to, according to the original CSQ-24 structure proposed by Harland and Georgieff (2003). Therefore this EFA again shows overwhelming support for the original structure of the CSQ-24 within this particular patient cohort (BeBack). Only two of the CSQ-24 items (item 2 and item 9) do not load uniquely onto the expected factors (they appear to be cross-loading). Item 9 is again cross-loading between the reinterpretation subscale (factor loading = 0.33) and the cognitive coping subscale (factor loading = 0.46), and item 2 (supposedly belonging to the diversion subscale) is cross-loading between the diversion subscale (factor loading = 0.41) and the reinterpretation subscale (factor loading = 0.34). However, the cross-loading of these items presents only a minor deviation from the original structure of the CSQ-24 and it appears acceptable to utilise the original structure based on the evidence from both EFAs presented here (Sample A and whole sample data). The

Table 5.5: Total variance explained by the extracted factors

Factor	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total
1	10.60	46.09	46.09	10.19	44.31	44.31	6.28
2	2.33	10.12	56.21	1.94	8.43	52.74	6.93
3	1.20	5.21	61.42	0.78	3.40	56.14	6.82
4	1.03	4.46	65.88	0.61	2.67	58.81	8.02
5	0.80	3.46	69.34				
6	0.71	3.07	72.41				
7	0.58	2.54	74.95				
8	0.55	2.40	77.35				
9	0.54	2.35	79.70				
10	0.46	2.00	81.70				
11	0.45	1.94	83.64				
12	0.42	1.82	85.45				
13	0.38	1.64	87.09				
14	0.37	1.60	88.69				
15	0.36	1.58	90.27				
16	0.35	1.52	91.78				
17	0.32	1.38	93.16				
18	0.30	1.32	94.48				
19	0.28	1.20	95.68				
20	0.27	1.16	96.84				
21	0.27	1.15	97.99				
22	0.25	1.08	99.07				
23	0.22	0.93	100.00				

contradictory results of the CFAs presented here (whole sample and Sample B data) suggest an opposing view, as they indicate that the original CSQ-24 structure is not appropriate for use in the BeBack patient cohort. The discrepancy between these two sets of results must be examined to determine whether or not the CSQ-24 in its original form is suitable for use in the remaining chapters of this thesis. This will be discussed in the following section.

Table 5.6: Pattern matrix showing factor loadings for a four-factor solution

Items	Factor			
	1	2	3	4
CSQ 7 (RE)	**0.60**	0.19	0.06	0.06
CSQ 14 (RE)	**0.55**	0.12	0.07	0.21
CSQ 1 (RE)	**0.51**	0.09	0.18	0.07
CSQ 23 (RE)	**0.50**	0.09	0.12	0.27
CSQ 3 (RE)	**0.38**	0.04	0.24	0.11
CSQ 5 (CAT)	-0.02	**0.84**	-0.03	0.02
CSQ 18 (CAT)	0.03	**0.82**	-0.06	0.01
CSQ 4 (CAT)	-0.10	**0.81**	0.02	0.04
CSQ 11 (CAT)	-0.04	**0.74**	0.02	0.07
CSQ 19 (CAT)	0.12	**0.67**	-0.00	0.05
CSQ 6 (CAT)	0.14	**0.64**	0.10	-0.09
CSQ 15 (CC)	0.09	-0.01	**0.81**	-0.07
CSQ 17 (CC)	-0.15	0.10	**0.70**	0.03
CSQ 8 (CC)	0.06	0.09	**0.68**	-0.02
CSQ 10 (CC)	0.02	-0.04	**0.66**	0.14
CSQ 16 (CC)	0.13	-0.15	**0.64**	0.18
CSQ 9 (RE)	**0.33**	0.05	**0.46**	0.04
CSQ 20 (DIV)	0.07	-0.01	-0.01	**0.76**
CSQ 22 (DIV)	-0.13	0.03	0.14	**0.74**
CSQ 21 (DIV)	-0.07	0.11	0.10	**0.69**
CSQ 13 (DIV)	0.15	0.03	-0.02	**0.66**
CSQ 12 (DIV)	0.25	0.16	-0.06	**0.52**
CSQ 2 (DIV)	**0.34**	0.07	0.05	**0.41**

* (DIV) = Diversion subscale, (CAT) = Catastrophizing subscale, (CC) = Cognitive coping subscale, (RE) = Reinterpretation subscale

5.6. Discussion

In an attempt to determine the suitability of the CSQ-24 for use in the remaining analytical chapters of this thesis, several factor analyses were performed with mixed results emerging. Presented below is a discussion of these analyses.

5.6.1. Initial confirmatory factor analysis of the CSQ-24

CFA was thought to be an appropriate technique for use on the CSQ-24, given that the measure is established and that it was developed within a British low back pain population. However, a chronic pain population was used to develop the CSQ-24, whereas the dataset used within this thesis comprised a mix of acute and chronic pain patients at baseline. Only approximately one third of the BeBack sample (31.8%) was suffering from a chronic pain problem (see Chapter 3). It might have been more appropriate to utilise only these chronic pain patients here for the CFA to ensure maximum comparability between the samples, however it was felt necessary to perform the CFA utilising both the acute and chronic BeBack patients to ensure that the resulting factor structure was applicable across the whole sample and therefore appropriate for use throughout the rest of this thesis. Despite the differences between the samples, it was still expected that the CFA would support the original CSQ-24 structure proposed by Harland and Georgieff (2003). In fact, the CFA showed only very weak evidence to support this structure. Although the RMSEA value indicated mediocre fit, both the CFI and chi-square values indicated that there was no fit of the model to the data. Therefore, it was concluded that the original structure of the CSQ-24 was not appropriate for further use here. A similar conclusion was made by Chan et al (2007) following their CFA of the CSQ-24. They also reported a significant chi-square value (suggesting no fit), a CFI value of 0.86 (suggesting no fit), and an RMSEA value of 0.09 (suggesting mediocre fit). The similarities between the goodness-of-fit statistics reported by Chan et al (2007) and those reported here reveal consistent findings across these studies that call into question the factor structure of the CSQ-24.

However, it is important to examine these findings further, as there might be other explanations for the result reported here.

One possible explanation is that the differences between patients in the two samples could be responsible for the poor model-fit reported here. The BeBack sample consists of primary care low back pain patients, whereas the sample used to develop the CSQ-24 consisted of patients attending hospital outpatient appointments. These hospital outpatients had already consulted at the primary care level for their back pain and had been referred on to secondary care by their GPs. They might therefore represent a considerably more severe and chronic population than the BeBack patients, who were consulting their GPs in primary care. These differences in patient populations could result in different CSQ-24 structures being appropriate, as patients' coping structures may differ with their differing levels of chronicity. In addition to this, it might also be possible to interpret the goodness-of-fit statistics in an alternative way. It might be more appropriate to discount the chi-square value in this case, as this statistic is particularly sensitive to large sample sizes (Harrington, 2009). Due to the large sample utilised here (n = 1,591), the chi-square value was almost certainly going to be significant in this case. With this value excluded from our interpretation of model-fit, we must utilise the two remaining statistics (CFI and RMSEA) to decide whether the CSQ-24 structure is supported. With one of these values (RMSEA) suggesting that the model did fit the data (regardless of the strength of this fit), and one (CFI) suggesting that it did not, it could be argued that the results were inconclusive, and that further investigation should be undertaken.

5.6.2. Split sample exploratory and confirmatory factor analyses of the CSQ-24

It was felt that the best way to further investigate the factor structure of the CSQ-24 was to perform an exploratory factor analysis (EFA) to determine the most appropriate structure for the data. The BeBack sample was randomly split in half to enable a later CFA of the structure identified by the EFA here.

Contrary to expectations, the EFA identified a factor structure that was practically identical to the original CSQ-24 structure proposed by Harland and Georgieff (2003). This finding was surprising based on the results of the earlier CFA, as the two findings seem to conflict each other. Therefore, a further CFA was performed on the second half of the sample in an attempt to confirm the findings of the EFA. This produced another unexpected result, with the CFA again suggesting that the model did not fit the data. These results are contradictory, and it was felt that in order to try to provide some clarity, an EFA needed to be performed on the whole sample in an attempt to shed some light on the factor structure of the CSQ-24.

5.6.3. Exploratory factor analysis of the CSQ-24

The results of the whole sample EFA supported those of the split sample EFA, in that the original CSQ-24 structure was replicated almost exactly. Both EFAs provide strong support for the original structure, with only one item cross-loading in the split sample analysis, and only two items cross-loading in the whole sample analysis. It is odd therefore, that the confirmatory factor analyses did not identify good model fit. Several possible explanations for this have already been outlined

above, but these surprising results could also be due to limitations associated with the analytic techniques used and/or the dataset used here (see section 5.6.4.).

5.6.4. Limitations

The inconsistent findings might relate to methodological differences between the CFA and EFA techniques. For example, the level of measurement here is not continuous, with responses to the CSQ-24 made on a 7-point Likert-type scale ranging from 0 (never) to 6 (always). Although this exceeds the minimum of five response categories outlined by Cohen et al (2003), it still does not resemble continuous data – the responses are categorical, and the gaps between the levels are probably uneven. It is possible that this was detected by the CFA, which subsequently specified a misfit of the model to the data. However, this is unlikely to have affected the EFA to the same extent, due to the less stringent modelling assumptions of EFA and the greater sensitivity of CFA to departures from model assumptions.

A further limitation here may be the CFA technique itself. It is questionable whether CFA is an appropriate technique with regards to its usefulness in studies such as this one. CFA's lack of ability to confirm the original CSQ-24 factor structure, even after this was determined as the optimal structure through the use of EFA, seems to suggest that CFA itself may be a poor statistical technique and should be used cautiously. Chan et al (2007) also failed to confirm the original CSQ-24 structure using CFA, however they did not perform an EFA on their data, so it is not possible to verify conclusively the problematic nature of the CFA technique. Another study utilising CFA supports the finding that this statistical

technique can be problematic. Wittkowski et al (2008) performed both CFA and EFA to determine the factor structure of the Revised Illness Perceptions Questionnaire (IPQ-R) in patients with atopic dermatitis and found that although the original factor structure of the IPQ-R (Moss-Morris et al, 2002) was not confirmed using CFA, analyses undertaken using EFA did replicate the original subscales. These findings are very similar to the findings here in relation to the CSQ-24 factor structure. CFA's inability to confirm the results of EFA is examined in detail by van Prooijen and van der Kloot (2001). They propose the comparability of these two factor analytic techniques as a possible explanation for the lack of correspondence between results, stating that only methodological explanations can account for cases in which EFA and CFA lead to different conclusions based on the same data. They state that: "a number of parameters that were unconstrained in the exploratory analysis are restricted in the subsequent confirmatory analysis. Because CFA typically has more restrictions than EFA, it is therefore by nature more conservative than EFA" (van Prooijen and van der Kloot, 2001, pg. 779). Commenting on this difference in conservativeness between EFA and CFA, van Prooijen and van der Kloot (2001) stated that on one hand, CFA may sometimes be too conservative, with relatively small and unimportant deviations from the model often leading to model rejection, and on the other hand, EFA may sometimes be too liberal because it may sometimes be too easy to interpret an EFA solution as satisfactory. They concluded by highlighting the need for further statistical research to explore the discrepancies between the EFA and CFA techniques.

5.6.5. Conclusion

The first aim of this chapter was to provide a detailed overview of the measurement of cognitive coping strategies. Several measurement instruments were reviewed within this chapter, including both generic and pain-specific measures, and the strengths and limitations of these measures were discussed. It was concluded that the CSQ was the instrument of most value in clinical settings due to its support in the clinical literature. It was also concluded that a more recent, revised version of this measure (the CSQ-24), was most appropriate due to its shorter length.

The second aim of this chapter was to determine whether the CSQ-24 is suitable for use within the remaining chapters of this thesis. The analyses presented here demonstrated mixed results. CFA suggested that the original CSQ-24 factor structure might not be appropriate for use with the BeBack dataset, however EFA revealed strong support for the original structure. Given this, and the potential limitations of CFA found also in other studies (see section 5.6.4.), it was concluded that use of the original CSQ-24 factor structure with the BeBack dataset would be the best approach to take. Therefore, the remaining chapters in this thesis will utilise the original CSQ-24 factor structure to examine cognitive coping strategies.

The following chapter (see Chapter 6) will utilise the CSQ-24 in its original factor structure, along with the newly developed measure of behavioural coping (see Chapter 4) and several other coping measures, in order to examine the relationships between demographic, clinical, and coping variables and to identify important epidemiological patterns of coping.

6. Cross-sectional analyses: baseline associations between demographic, clinical and coping variables

This chapter aims to examine the relationships between demographic, clinical, and coping variables in primary care consulters with low back pain. Cross-sectional analyses will be performed using the baseline BeBack data to examine whether there are any significant associations between coping and socio-demographic variables, between coping and clinical variables, and between different coping variables. These analyses will help to determine whether coping differs according to other patients characteristics, thus identifying which of these characteristics could be potential confounding variables of the prospective relationship between coping and low back pain outcome. This will subsequently inform future prospective analyses within this thesis.

6.1. Associations between coping and socio-demographic factors

Potentially important coping variables have been identified earlier in this thesis (see Chapters 1 and 2). Of these, the following coping variables were included within the BeBack dataset (see Chapter 1 for a description of the BeBack study): cognitive coping strategies (catastrophizing, diversion, reinterpretation, cognitive coping), behavioural coping strategies (active, passive), fear avoidance beliefs, self-efficacy, anxiety and depression (see Appendix 1, pg. 357 for the baseline BeBack questionnaire). The following section will examine whether these coping variables are significantly associated with key socio-demographic variables at baseline: age, gender, employment status, and socio-economic status (SES).

Coping and age

Linear regression is a statistical analysis technique that is used to explore the relationship between an independent and a dependent variable. It fits a predictive model to the data and then uses that model to predict values of the dependent variable from the independent variable. Although cause and effect cannot be established when using cross-sectional data, significant associations can be identified for future analysis using longitudinal data.

Linear regression analysis was performed here to examine whether any of the coping variables were associated with age (see Chapter 3, section 3.3, for information on the distribution of age among baseline responders). Table 6.1 details the strength of these associations for each of the coping variables.

Table 6.1: Associations between coping variables and age[1]

	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
Cognitive coping				
Catastrophizing	-0.133	0.034	-3.881	<0.001**
Diversion	0.110	0.033	3.369	0.001**
Reinterpretation	-0.026	0.039	-0.656	0.512
Cognitive coping	0.195	0.042	4.652	<0.001**
Behavioural coping				
Active	-0.203	0.297	-0.683	0.495
Passive	-0.120	0.198	-0.605	0.545
Other coping variables				
Fear avoidance beliefs	-0.110	0.039	-2.806	0.005**
Self-efficacy expectations	0.023	0.019	1.241	0.215
Anxiety	-0.078	0.060	-1.294	0.196
Depression	0.096	0.063	1.525	0.127

[1]Only people with full data on all coping variables and age were included (n = 1,459)
*t = significant (p<0.05)
**t = significant (p<0.01)

Table 6.1 shows that only four baseline coping variables were significantly associated with age and that despite reaching statistical significance, these associations were small in magnitude. The steepest association was found between age and cognitive coping, with older patients utilising more cognitive coping than younger patients. Older patients also utilised more diversion strategies, and reported less catastrophizing and fear avoidance beliefs.

Coping and gender

Mean coping scores were calculated separately for males and females (see Chapter 3, section 3.3, for percentages of males and females in the baseline sample), and independent samples t-tests were performed to determine whether the difference between the means (males and females) was significant (see table 6.2). The full range of scores for each of the coping variables is presented in Chapter 3 (see section 3.5). Table 6.2 reveals a consistent pattern of coping differences between male and female patients. The differences reported are small in magnitude, but females utilised more cognitive and behavioural coping strategies than males. Small, yet statistically significant differences were also found for several of the other coping variables, with females reporting higher levels of anxiety and lower fear avoidance beliefs than males. The cut-off point on the measurement instrument used to measure fear avoidance beliefs in this study (TSK) was $\geq$41 to indicate a high level of fear avoidance beliefs (see Chapter 3, section 3.5.2, for further information about cut-off points). The different mean scores for males and females reported here show that females were, on average, below this cut-off point, whereas the mean score for males was above this cut-off.

There was also a small significant difference between males and females in their levels of depression, with males reporting slightly higher levels of depression than females.

Table 6.2: Associations between coping variables and gender[1]

Variables	Mean scores (Std. Deviation)		t	Sig.
	Males (n = 613)	Females (n = 846)		
Cognitive coping				
Catastrophizing	9.38 (8.02)	10.28 (7.75)	2.138	0.033*
Diversion	14.00 (8.37)	16.49 (8.01)	5.762	<0.001**
Reinterpretation	7.35 (6.77)	8.14 (7.05)	2.158	0.031*
Cognitive coping	15.98 (6.74)	16.40 (6.17)	1.206	0.228
Behavioural coping				
Active	1.11 (0.88)	1.15 (0.94)	0.769	0.442
Passive	2.06 (1.42)	2.23 (1.33)	2.306	0.021*
Other coping variables				
Fear avoidance beliefs	41.27 (6.94)	38.59 (6.61)	-7.470	<0.001**
Self-efficacy expectations	37.62 (14.93)	38.01 (14.15)	0.502	0.616
Anxiety	7.87 (4.58)	8.50 (4.47)	2.627	0.009**
Depression	6.76 (4.49)	6.30 (4.19)	-1.995	0.046*

[1]Only people with full data on all coping variables and gender were included (n = 1,459)
*t = significant (p<0.05)
**t = significant (p<0.01)

Coping and employment status

All patients who were not currently working were incorporated within the 'unemployed' category in the BeBack dataset. This included patients who were not working due to low back pain, as well as housewives, retired patients, students, and those who were not working due to other reasons.

Mean coping scores were calculated separately for employed and unemployed patients (see Chapter 3, section 3.3, for percentages of baseline responders who were employed and unemployed), and independent samples t-tests were again

performed to determine whether the mean difference in employment status was significant (see table 6.3). See Chapter 3 (section 3.5) for the full range of scores for each of the coping variables.

Table 6.3: Associations between coping variables and employment status[1]

Variables	Mean scores (Std. Deviation)		t	Sig.
	Employed (n = 1,086)	Unemployed (n = 358)		
Cognitive coping				
Catastrophizing	8.70 (7.17)	13.37 (8.77)	9.114	<0.001**
Diversion	14.75 (8.29)	17.38 (7.84)	5.268	<0.001**
Reinterpretation	7.61 (6.87)	8.34 (7.16)	1.722	0.085
Cognitive coping	16.57 (6.40)	15.22 (6.41)	-3.475	0.001**
Behavioural coping				
Active	1.18 (0.91)	1.01 (0.92)	-3.121	0.002**
Passive	2.02 (1.34)	2.57 (1.38)	6.585	<0.001**
Other coping variables				
Fear avoidance beliefs	38.99 (6.57)	41.94 (7.36)	6.768	<0.001**
Self-efficacy expectations	40.61 (13.26)	29.64 (14.83)	-12.460	<0.001**
Anxiety	7.58 (4.25)	10.16 (4.72)	9.206	<0.001**
Depression	5.76 (3.95)	8.62 (4.62)	10.478	<0.001**

[1]Only people with full data on all coping variables and employment status were included (n = 1,444)
*t = significant (p<0.05)
**t = significant (p<0.01)

Table 6.3 shows statistically significant mean differences between employed and unemployed patients at baseline on all coping variables, with the exception of reinterpretation. These mean differences are larger than the differences found between males and females on the coping variables (shown in table 6.2). Unemployed patients scored higher on catastrophizing, diversion, passive behavioural coping, fear avoidance beliefs, anxiety, and depression, and lower on cognitive coping, active behavioural coping, and self-efficacy. Differences in mean scores between employed and unemployed patients were large for most of the coping variables, and particularly for self-efficacy, catastrophizing, anxiety, and

depression. In the case of fear avoidance beliefs and self-efficacy, the two groups (employed/unemployed) differed across the cut-off points for these variables (see Chapter 3, sections 3.5.2 and 3.5.3, for further information about cut-off points). Unemployed patients were found to have a high level of fear avoidance beliefs (≥41), whereas the mean fear avoidance beliefs score for employed patients was below this cut-off point. In addition, the mean self-efficacy score for employed patients revealed a high level of self-efficacy expectations within this subgroup of patients (>40), whereas the mean score for unemployed patients showed markedly lower self-efficacy expectations amongst this subgroup.

Coping and socio-economic status

Analysis was undertaken to examine differences in patients' coping variable scores between different socio-economic status (SES) groups (see Chapter 3, section 3.3, for information on the distribution of SES among baseline responders). SES was divided into three categories within the BeBack dataset[1], therefore a one-way ANOVA with post-hoc tests was used to examine differences between the SES groups (see table 6.4). Group means are also presented in table 6.4. The full range of scores for each of the coping variables is presented in Chapter 3 (see section 3.5). Table 6.4 shows that with the exception of reinterpretation, scores on all coping variables were significantly associated with SES. For catastrophizing and self-efficacy, all SES groups significantly differed from each other, but for the remaining cognitive and behavioural coping strategies, the difference was found between the highest (group 1) and the lowest (group 3) SES groups. This finding

[1] SES categories: 1 = Managerial or professional occupations
2 = Intermediate occupations (including self-employed)
3 = Routine/semi-routine occupations

was also evident for the other coping variables, although a significant difference between groups 1 and 2 was found in addition. Strategies traditionally considered as negative or maladaptive were increasingly utilised with decreasing SES, and strategies traditionally considered as positive or adaptive were utilised increasingly more with increasing SES.

Table 6.4: Associations between coping variables and SES[1]

Variables	Mean scores (Std. Deviation) across SES groups			F	Sig.
	1 Managerial / Professional (n = 415)	2 Intermediate (n = 368)	3 Routine / Semi-routine (n = 509)		
Cognitive coping					
Catastrophizing [a]	7.42 (6.45)	9.41 (7.28)	11.11 (8.22)	28.19	<0.001**
Diversion [b]	14.26 (8.00)	14.79 (8.15)	16.09 (8.33)	6.14	0.002**
Reinterpretation	7.64 (6.63)	7.52 (6.90)	7.99 (7.29)	0.54	0.583
Cognitive coping [b]	16.95 (6.12)	16.46 (6.27)	15.67 (6.77)	4.67	0.010*
Behavioural coping					
Active [b]	1.29 (0.95)	1.19 (0.86)	1.06 (0.92)	6.95	0.001**
Passive [b]	1.97 (1.36)	2.14 (1.36)	2.23 (1.37)	4.01	0.018*
Other coping variables					
Fear avoidance beliefs [c]	37.83 (6.66)	39.84 (6.37)	40.61 (6.98)	20.36	<0.001**
Self-efficacy expectations [a]	42.41 (12.91)	38.57 (13.62)	35.61 (15.06)	27.06	<0.001**
Anxiety [c]	7.07 (4.19)	8.10 (4.48)	8.75 (4.42)	17.07	<0.001**
Depression [c]	5.08 (3.81)	6.43 (4.27)	7.07 (4.26)	26.98	<0.001**

[1]Only people with full data on all coping variables and SES were included (n = 1,292)
*F = significant (p<0.05)
**F = significant (p<0.01)
a = significant differences between all SES groups
b = significant differences between SES groups 1 and 3
c = significant differences between SES groups 1 and 2, and between groups 1 and 3

6.2. Associations between coping and clinical factors

The following section will examine if the coping variables (see section 6.1) are significantly associated with the following clinical factors: pain intensity, disability, and duration of pain (see Chapter 3, section 3.4, for further information on the measurement and distribution of scores on these variables among baseline responders).

Coping and pain intensity

Linear regression analysis was performed to examine whether any of the coping variables were associated with pain intensity (measured using the mean score of patient ratings of least pain, usual pain, and current pain levels). Table 6.5 details the strength of these associations for each of the coping variables. Table 6.5 shows that, with the exception of active behavioural coping, all of the coping variables were significantly associated with pain intensity. The greatest associations were found with self-efficacy, depression, and catastrophizing. Patients reporting higher levels of pain intensity reported higher scores on measures of depression and catastrophizing, as well as lower self-efficacy scores.

Coping and disability

A second linear regression analysis was performed to determine whether there were any significant associations between the coping variables and disability

(measured using the Roland-Morris Disability Questionnaire). The strength of these associations for each of the coping variables is presented in table 6.6.

Table 6.5: Associations between coping variables and pain intensity[1]

	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
Cognitive coping				
Catastrophizing	0.158	0.007	23.059	<0.001**
Diversion	0.063	0.007	8.460	<0.001**
Reinterpretation	0.021	0.009	2.335	0.020*
Cognitive coping	-0.055	0.010	-5.611	<0.001**
Behavioural coping				
Active	0.073	0.069	1.057	0.291
Passive	0.654	0.043	15.296	<0.001**
Other coping variables				
Fear avoidance beliefs	0.136	0.008	16.010	<0.001**
Self-efficacy expectations	-0.096	0.004	-26.789	<0.001**
Anxiety	0.247	0.012	19.839	<0.001**
Depression	0.312	0.012	25.641	<0.001**

[1]Only people with full data on all coping variables and pain intensity were included (n = 1,438)
*t = significant (p<0.05)
**t = significant (p<0.01)

Table 6.6 shows that, with the exceptions of active behavioural coping and reinterpretation, all of the coping variables were significantly associated with disability. These results replicate those found for pain intensity (see table 6.5), with the greatest associations again being found with self-efficacy, depression, and catastrophizing (in the same direction as for pain intensity).

Table 6.6: Associations between coping variables and disability[1]

	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
Cognitive coping				
Catastrophizing	0.427	0.017	25.798	<0.001**
Diversion	0.142	0.019	7.578	<0.001**
Reinterpretation	0.035	0.023	1.553	0.121
Cognitive coping	-0.209	0.024	-8.742	<0.001**
Behavioural coping				
Active	0.299	0.172	1.736	0.083
Passive	2.042	0.101	20.160	<0.001**
Other coping variables				
Fear avoidance beliefs	0.427	0.020	21.397	<0.001**
Self-efficacy expectations	-0.283	0.008	-35.694	<0.001**
Anxiety	0.656	0.030	21.703	<0.001**
Depression	0.889	0.028	31.836	<0.001**

[1]Only people with full data on all coping variables and disability were included (n = 1,459)
*t = significant (p<0.05)
**t = significant (p<0.01)

Coping and pain duration

A one-way ANOVA was performed to examine differences between coping variables and the duration of patients' current episode of low back pain, which was divided into five categories within the BeBack dataset[2]. Table 6.7 presents the mean scores for the duration of pain groups on each of the coping variables, along with the results of the one-way ANOVA. See Chapter 3 (section 3.5) for the full range of scores for each of the coping variables.

[2] Duration of pain categories:
1 = Less than 1 month
2 = 1 to 3 months
3 = 4 to 6 months
4 = 7 months to 3 years
5 = More than 3 years

Table 6.7: Associations between coping variables and pain duration[1]

Variables	Mean scores (Std. Deviation) across duration of pain groups					F	Sig.
	1 Less than 1 month (n = 535)	2 1 to 3 months (n = 412)	3 4 to 6 months (n = 141)	4 7 months to 3 years (n = 162)	5 More than 3 years (n = 169)		
Cognitive coping							
Catastrophizing	8.16 (7.12)	9.45 (7.34)	10.49 (7.67)	11.42 (8.01)	14.21 (8.99)	22.83	<0.001**
Diversion	14.45 (8.17)	15.55 (7.61)	15.98 (8.25)	16.16 (9.35)	17.09 (8.57)	4.16	0.002**
Reinterpretation	7.15 (6.44)	8.14 (6.91)	8.33 (7.25)	8.63 (8.14)	8.10 (7.01)	2.27	0.060
Cognitive coping	16.08 (6.31)	16.25 (6.06)	16.65 (6.38)	16.77 (6.86)	16.03 (6.67)	0.55	0.696
Behavioural coping							
Active	1.11 (0.88)	1.16 (0.90)	1.33 (0.89)	1.15 (0.99)	1.14 (0.94)	1.74	0.139
Passive	2.20 (1.36)	2.21 (1.32)	1.99 (1.29)	1.91 (1.39)	2.42 (1.40)	3.71	0.005**
Other coping variables							
Fear avoidance beliefs	38.88 (6.44)	39.16 (6.34)	39.88 (5.28)	40.01 (7.64)	43.47 (8.30)	16.11	<0.001**
Self-efficacy expectations	40.37 (13.93)	38.80 (13.61)	37.17 (13.76)	36.39 (14.43)	29.72 (14.81)	19.63	<0.001**
Anxiety	7.64 (4.44)	7.88 (4.31)	8.31 (4.10)	8.98 (4.63)	10.27 (4.76)	13.13	<0.001**
Depression	5.76 (4.17)	6.22 (3.95)	6.28 (3.96)	7.46 (4.60)	8.66 (4.67)	17.93	<0.001**

[1]Only people with full data on all coping variables and duration of pain were included (n = 1,419)
*F = significant (p<0.05)
**F = significant (p<0.01)

Table 6.7 shows that for the majority of coping variables, a dose response relationship emerges across the pain duration groups (i.e. as pain duration increases, negative coping also increases and positive coping decreases in a linear fashion). The only exception here (amongst those coping variables that were significantly associated with pain duration) was passive coping. Mean passive coping scores were fairly similar for each pain duration group, but the highest pain duration group (more than 3 years) had a much larger mean score, and this was significantly different from the 4 to 6 months group and the 7 months to 3 years group.

Despite not reaching statistical significance, the differences between mean active coping scores across the pain duration groups shows an increase in scores in a linear fashion from the lowest pain duration group (less than 1 month) to the middle group (4 to 6 months), however from this point, they begin to decrease in a linear fashion across the two highest pain duration groups.

6.3. Associations between coping strategies

The following section examines whether there are significant associations between different coping variables at baseline. A Pearson's Product Moment correlation coefficient test was used to examine correlations between the coping variables to determine whether any interrelationships exist, as these interrelationships could indicate potential confounding that should be controlled for within future prospective analyses. The correlation matrix is presented in table 6.8.

Table 6.8: Correlations between coping variables[1]

	CSQ Cat	CSQ Div	CSQ Rein	CSQ Cog	Active behavioural	Passive behavioural	Fear avoidance	Self-efficacy	Anxiety	Depression
CSQ Cat	r = 1	r = 0.239**	r = 0.115**	r = -0.235**	r = -0.010	r = 0.320**	r = 0.533**	r = -0.575**	r = 0.534**	r = 0.601**
CSQ Div		r = 1	r = 0.558**	r = 0.325**	r = 0.082**	r = 0.168**	r = 0.052*	r = -0.090**	r = 0.134**	r = 0.066*
CSQ Rein			r = 1	r = 0.418**	r = 0.067*	r = 0.020	r = -0.030	r = 0.054*	r = 0.100**	r = 0.030
CSQ Cog				r = 1	r = 0.074**	r = -0.180**	r = -0.313**	r = 0.447**	r = -0.165**	r = -0.282**
Active behavioural					r = 1	r = 0.107**	r = -0.114**	r = 0.041	r = 0.012	r = -0.032
Passive behavioural						r = 1	r = 0.251**	r = -0.397**	r = 0.233**	r = 0.312**
Fear avoidance							r = 1	r = -0.537**	r = 0.371**	r = 0.459**
Self-efficacy								r = 1	r = -0.456**	r = -0.648**
Anxiety									r = 1	r = 0.709**
Depression										r = 1

[1]Only people with full data on all coping variables were included (n = 1,459)
*r = significant (p<0.05)
**r = significant (p<0.01)

Table 6.8 shows that the majority of the coping variables were inter-correlated, revealing that they are not independent of one another. Using Cohen's (1988) suggested cut off point of 0.50 and above for large correlations, it is clear that several of the correlations reported in table 6.8 can be considered large. The largest of these was found between anxiety and depression (r = 0.709). Other large correlations were found between catastrophizing, fear avoidance beliefs, self-efficacy, anxiety, and depression. There was also a large correlation between diversion and reinterpretation, suggesting that these two forms of cognitive coping might be connected in some way. However, none of the correlations were large enough to violate the assumptions for linear regression analysis regarding multicollinearity (r = less than 0.9 in all cases). All of the associations not reaching statistical significance involved either active coping or reinterpretation. In fact, referring again to Cohen's (1988) suggestion of a minimum r value of 0.10 for small correlations, active coping was only associated with passive coping and fear avoidance beliefs, and these associations were extremely small (r = 0.107 and 0.114, respectively).

6.4. Discussion

This chapter examined the relationships between demographic, clinical, and coping variables in order to inform later analytical chapters of this thesis, by identifying potential confounders and significant relationships to inform prospective analyses. For example, the identification of potential confounders here can be taken forward to help indicate which variables should be controlled for within future thesis chapters addressing prospective relationships. This chapter did identify

potential confounders, with the main findings showing particularly large associations between coping variables and employment status, SES, pain intensity, and disability, as well as inter-correlations between many of the coping variables.

6.4.1. Associations between coping and socio-demographic factors

Associations were found between age and several of the cognitive coping strategies, revealing that older patients used more cognitive coping and diversion strategies, and reported less catastrophizing and fear avoidance beliefs than younger patients. This suggests that older patients tend to cope more adaptively with low back pain than younger patients. There could be several possible explanations for this finding. It is possible that, due to their increased life experience, older patients have learned how to cope more adaptively over the years and are able to benefit from this experience when making attempts to cope with their pain. It is also possible that patients' perceptions of the seriousness of back pain could be responsible for the associations between coping and age. It is possible that older patients perceive low back pain to be less serious or threatening, as they either experience or expect to experience more serious conditions than younger patients due to the increased risk of certain health problems associated with older age. This issue was examined by Keller et al (1989), who stated that it is possible that the perception of illness may be influenced by age and that this may account for age-group differences in coping. They proposed that "For example, if arthritis is considered quite serious when it occurs in a middle-aged person but not at all serious when it occurs in an older

one, then one would expect age differences in coping with arthritis to result" (pg. 247). Therefore if older patients perceive their low back pain as less serious than younger patients, or perceive the condition to be 'caused' by ageing, this might lead to greater acceptance and lower subsequent reporting of catastrophizing and fear avoidance beliefs than younger patients. Keller et al (1989) also identified this possibility, stating that older patients may believe that their health problems are "inevitable and must simply be accepted as part of life" (pg. 254). The findings here suggest that age might be a confounding variable in the relationship between coping and outcome, however the reported associations were small and could therefore be clinically unimportant. This will need to be determined before a prospective coping model can be developed using this dataset.

No association was found between age and behavioural coping, suggesting that this type of coping is not age-related. As the findings for several of the cognitive coping strategies suggested that older patients tend to cope more adaptively, it was surprising that the associations between age and behavioural coping did not follow this pattern. As the behavioural coping measure was newly developed for this thesis (see Chapter 4), there is no existing literature for comparison (see Chapter 2 for a systematic review of the existing literature). Therefore, interesting or surprising results in relation to behavioural coping must be examined by future research studies utilising this new measure of behavioural coping.

The associations between the coping variables and gender were also interesting, as even though only small differences were found, they showed a definite trend with females consistently utilising more cognitive and behavioural coping strategies than males. A similar finding was reported by Blyth et al (2005) who investigated the use of self-management strategies in chronic pain patients

and found that both active only and passive only strategies were utilised by a higher percentage of females than males. The difference between male and female reporting of fear avoidance beliefs is interesting, as it reveals that the average male within this sample has a high level of fear avoidance beliefs (above the cut-off point used in this thesis, see Chapter 3, section 3.5.2), whereas the average female does not. This is indicative of a clinically important difference between male and female patients, therefore gender must be controlled for in further prospective analyses using this database to analyse the fear avoidance data. Table 6.2 shows that a statistically significant difference in anxiety scores was also found, with females reporting higher mean scores than males. This finding was as expected, and supports previous research on gender differences in the prevalence of affective disturbances (Fritschi et al, 2009; Yuan et al, 2009). Previous research has also consistently shown a higher prevalence of depression among women compared with men (Carroll et al, 2000; Hammarstrom et al, 2009; Nagase et al, 2009). However the results presented here show conflicting evidence. Males were found to have significantly higher mean depression scores than females. This finding is surprising, but could potentially be attributed to the lower percentage of GP consultations for low back pain by males compared with females (Dunn and Croft, 2005). This suggests that only the more severe male low back pain patients are consulting for their condition, as opposed to a broader severity spectrum of female low back pain consulters. As the more chronic patients are likely to be more depressed (Fishbain et al, 1997; Kinney et al, 1993), it is plausible that a more chronic sample of male patients might have higher mean depression scores than a broader spectrum sample of female patients.

Employment status and SES were found to be associated with almost all of the coping variables, and many of these associations were large. All associations were in the expected direction, with unemployment and lower SES consistently associated with poorer coping. Interestingly, employed patients and patients in the highest SES group actually reported levels of self-efficacy that were classified as 'high' by this thesis, whereas levels of self-efficacy amongst unemployed patients and those in the lower SES groups were below this cut-off point. In addition, unemployed patients reported high levels of fear avoidance beliefs whereas employed patients' fear avoidance beliefs were below the cut-off. Therefore employment status and SES appear to be important variables in relation to patient coping, with large differences reported between groups on most of the coping variables. This suggests that employment status and SES should be controlled for in future prospective analyses when using this dataset to analyse all of the coping data. However, it is important to remember that these are unadjusted results and so their magnitude might be explained, in part, by other variables such as pain and disability (i.e. those with higher levels of pain and disability are more likely to be unemployed and also more likely to use maladaptive coping strategies). The trend in these results does support previous findings that have shown employment status to be associated with poor coping strategies, depression, and anxiety (Jones, 2002; Takaki and Yano, 2006), with studies indicating that poor coping can interfere with employment acquisition, as well as being related to increased sick leave (Geuskens et al, 2008; Jones, 2002). The results also support previous findings showing that patients with higher SES were less likely to catastrophize and to use passive coping strategies (Hadjistavropoulos et al, 1995). Tunks et al (2008) also reported that socioeconomic disadvantage and unemployment were

important mediators of chronic pain outcome, and it is possible that this relationship could also involve patient coping at some level. Therefore, future research in this area would be beneficial in order to test this hypothesis.

6.4.2. Associations between coping and clinical factors

Large associations were found between pain intensity and disability, and most of the coping variables. These associations were also in the expected direction, thereby supporting the consistently reported finding that increased pain and disability are associated with greater use of maladaptive coping strategies and lower use of adaptive coping strategies (Carroll et al, 2006; Mercado et al, 2000; Sullivan et al, 2001; Turner et al, 2000; Woby et al, 2005). The similarities between these sets of associations could reflect the close relationship between pain intensity and disability that is often reported. Active behavioural coping was not significantly associated with pain intensity or disability, again indicating that the measurement instrument used might be problematic. However, it is also possible that active coping is simply a different type of coping strategy, which is evident from the different patterns of associations that have emerged here. Further research to clarify the theoretical position of active coping is therefore necessary before any firm conclusions can be drawn.

Associations between the coping variables and pain duration revealed a dose response relationship in the expected direction (i.e. maladaptive coping increases and adaptive coping decreases with increased pain duration), thereby supporting previous research findings (Dunn and Croft, 2006). This is good evidence for a relationship between pain duration and coping, however it does not exclude

confounding factors that might instead be responsible for the relationship. For example, it is possible that any number of factors (including those that were not measured by this study) could be responsible for the pattern of coping observed. For example, factors such as quality of life, locus of control, social support and religious beliefs could be important here. If these factors are related to pain duration but not reported, this could result in the appearance of a relationship between coping and pain duration, even if no actual relationship exists. However, the dose response relationship here provides a possible explanation for the finding that treatment response (to a 10-week community-based disability management intervention) decreased as episode duration extended over time (Sullivan et al, 2008). It is possible that this occurs through the increased use of maladaptive coping and/or the decreased use of adaptive coping reported here with increasing pain duration, as coping has previously been shown to predict low back pain outcome (see Chapter 2). It also appeared that once patients reached the three-year point (i.e. they had suffered with pain for three years or more), their coping changed quite noticeably, becoming considerably more maladaptive. The pattern of mean scores for the majority of the coping variables revealed a steady increase or decrease with increasing duration of pain, followed by a larger jump at the 'more than three years' point. This was particularly evident for catastrophizing, fear avoidance beliefs, and self-efficacy, with statistically significant differences emerging between mean scores for the 'more than three years' group, and mean scores for each of the four other pain duration groups. This three-year cut-off point was also highlighted by Dunn and Croft (2006) who stated that: "There are important differences between people who recall more or less than three years' duration" (pg. 126). Dunn and Croft (2006) also found increasing trends in

maladaptive coping scores with increasing duration of pain at baseline and their analyses suggested significant differences between patients who reported more or less than three years' duration. These differences were so apparent that Dunn and Croft (2006) suggested separating people into two groups (up to three years' duration and three or more years' duration) as an appropriate and relevant way to group people for further study of the prediction of low back pain outcome. However, the underlying reasons for the existence of this three-year point are unclear and further research is needed to improve our understanding of this (Dunn and Croft, 2006). However it could indicate that low back pain follows a certain timeline or trajectory, where patients advance through different psychological stages categorised by increasingly maladaptive beliefs and ways of coping. It is possible that this journey takes approximately three years to complete and that beyond this point, patients feel they have exhausted all potential coping avenues and thus 'give up' and/or allow their maladaptive beliefs to impact negatively on their coping efforts.

Although the three-year pain duration point appeared to be important for most of the pain coping strategies investigated here, the findings in relation to active behavioural coping were somewhat different. Although not reaching statistical significance, the trend in mean active coping scores suggested that the six-month point might be important, with scores found to peak at four to six months' duration. One potential explanation for this finding is that patients with new episodes of low back pain (up to three months' duration) might not think it necessary to employ active behavioural coping strategies until their pain condition becomes more persistent. However, when patients continue to suffer from pain beyond the six months, they might 'give up' on the use of active coping. The identification of a

possible six-month cut-off point was also reported by Dunn and Croft (2006), however their evidence was limited as they did not measure active coping. Examination of the trends found in the data here appears to show support for this six-month point, indicating that particular coping variables (e.g. active behavioural coping) change at around six-months' pain duration, whereas other coping variables change at around three-years' duration. It is important to remember that the relationship between active coping and pain duration did not reach statistical significance, therefore no firm conclusions can be drawn here. However the trends do indicate that different types of coping play key roles at different time points as pain duration increases.

6.4.3. Associations between coping strategies

Inter-correlations were found between most of the coping variables, showing that they are not independent of one another. However active coping only demonstrated small associations with other variables, suggesting that it might be independent of the other coping variables. Alternatively, it is possible that the different pattern of associations found between active coping and the other variables could be a reflection of the quality of the active coping measure used here. Active coping is notoriously difficult to measure and its measurement has produced conflicting results (see Chapter 1, section 1.4). It is highly likely that the measure of active coping that was developed within this thesis and used here suffers from problems similar to those of measures used in previous research, resulting in unexpected and inconsistent findings. One example of this is the positive correlation found here between active and passive coping. This shows

that as passive coping increases, active coping also increases. It would seem logical to hypothesize that an increase in passive coping would coincide with a decrease in active coping, not an increase, although it could also be that patients who are using behavioural coping strategies simply try everything they can think of, which would explain the positive correlation found here. However, there is still the possibility that the measurement instrument used might be problematic. Therefore further research must be conducted using this measure before any firm conclusions can be drawn.

The large inter-correlations found between many of the coping variables here are in-line with previous research suggesting that associations exist between coping strategies (Hadjistavropoulos et al, 1995; Leeuw et al, 2007; Weickgenant et al, 1993). This finding has important implications for the remaining chapters of this thesis. The inter-correlations found between the coping variables indicate that simple associations between these variables and outcome might be insufficient to determine an overall picture of the effects of coping on low back pain outcome over time. When testing the predictive effects of these coping variables on outcome, analyses should combine coping strategies into a predictive model that will clarify their independent effects.

6.4.4. Chapter summary

This chapter has not only shown that many coping variables are inter-correlated, it has also shown associations between these coping variables and socio-demographic and clinical variables. Associations between age and coping, and differences between males and females on the baseline coping variables were

small in magnitude, however large associations were found between the coping variables and employment status, SES, pain intensity, disability, and pain duration. This suggests that these variables could have important confounding effects on the prospective relationship between coping and low back pain outcome. It is therefore important that these clinical and demographic variables, where necessary, are considered and controlled for in the prospective analyses reported later in this thesis.

The analyses presented here were all conducted on a large and representative sample of primary care low back pain patients. Whilst this is a strength in terms of the quality of the results, it can also become a weakness due to the effects on statistical significance. Where large samples are used, even small associations become statistically significant. This is a problem that occurred here, and it is therefore important to place due emphasis on those results with the largest associations, such as those between coping and pain intensity and disability. This chapter addresses the problem by commenting on the magnitude of the associations and the likely clinical importance of the results.

There were several limitations with the study, which must be noted. Firstly, due to the cross-sectional nature of the analyses, it was impossible to determine causal relationships. It would be interesting to examine all of these associations prospectively to determine exactly which baseline variables are predictive of low back pain outcome, however it is beyond the scope of this thesis. Another limitation of the study was the use of the newly developed (see Chapter 4) measure of behavioural coping. It is difficult to generalise results or comment on its validity without any comparison literature. This was the first study to utilise this

new measure and will therefore hopefully provide a comparative reference for future studies that might also attempt to use the measure for similar analyses.

Despite the limitations, this study provides a comprehensive examination of the associations between socio-demographic, clinical, and coping variables to determine whether coping differs according to other patient characteristics in order to identify which of these characteristics could be potential confounding variables of the prospective relationship between coping and low back pain outcome. This prospective relationship is examined in the next chapter (see Chapter 7).

7. Do coping factors predict future low back pain and disability?

This chapter aims to determine which of the coping factors are independent predictors of future pain and disability for primary care low back pain patients (using the BeBack dataset). The results presented here add to the findings of the systematic review that was conducted previously (see Chapter 2). They also help to inform the remaining chapters of the thesis by identifying which of the coping variables are independently predictive of outcome, and they underpin the development of a predictive model combining both cognitive and behavioural coping strategies.

Important coping variables were identified in Chapter 6 of this thesis and examined for cross-sectional associations with pain and disability. Most of these coping variables were found to be significantly associated with baseline pain and disability. All of the coping variables will be examined here in the prediction of pain intensity and disability at 12-months follow-up.

7.1. Predicting pain intensity at 12-months follow-up

This section begins by examining the unadjusted associations between the baseline coping factors and pain intensity at 12 months. Associations between these variables are then examined whilst controlling for potential confounders (demographic variables and pain duration). Finally, this section examines the relationships between the baseline coping variables and pain intensity at 12 months whilst controlling for demographic variables, pain duration, and other

coping factors, in order to reveal which of the coping variables are independently predictive of 12-month pain intensity.

7.1.1. Controlling for demographic variables and pain duration

Baseline pain intensity was found to be cross-sectionally associated with nine out of a possible ten different coping variables (see Chapter 6). The influence of each of the coping variables was examined individually using linear regression analysis to determine whether they were significantly predictive of outcome (pain intensity) at 12-months follow-up. The Beta coefficient, a standardised regression coefficient, permits a direct comparison of the influence of each of the independent variables on the dependent variable as well as an estimate of statistical significance. To calculate the unadjusted Beta values, a separate linear regression analysis calculation was performed for each of the coping variables. To calculate the adjusted Beta values, linear regression analyses were repeated firstly with the demographic variables included in the model as independent variables, and then with the demographic variables and pain duration included. Adjustments for these variables were only made where there was an association between the confounder and the coping variable (see Chapter 6). For example, three of the coping variables (reinterpretation, cognitive coping, and active coping) were not associated with pain duration (see Chapter 6), therefore adjustment for pain duration here was unnecessary and not performed. Table 7.1 details the Beta values for each of the coping variables.

The first column in table 7.1 shows the unadjusted Beta values for each of the coping variables. This reveals that eight of the baseline coping variables were

Table 7.1: Relationships between baseline coping variables and pain intensity at 12 months

Coping variables	Beta	Beta	Beta
	Unadjusted	Adjusted for demographic variables#	Adjusted for demographic variables and pain duration##
Catastrophizing	0.45**	0.38**	0.33**
Diversion	0.20**	0.14**	0.12**
Reinterpretation	0.11*	0.10*	N/A[1]
Cognitive coping	-0.04	0.01	N/A[1]
Active behavioural coping	0.07	0.12*	N/A[1]
Passive behavioural coping	0.28**	0.22**	0.23**
Fear avoidance beliefs	0.30**	0.26**	0.22**
Self-efficacy	-0.43**	-0.35**	-0.31**
Anxiety	0.31**	0.23**	0.20**
Depression	0.42**	0.36**	0.32**

*Beta = significant ($p<0.05$)
**Beta = significant ($p<0.01$)
[1]N/A = adjustment for pain duration was not necessary, as the coping variable was not associated with pain duration (see Chapter 6)
Adjusted for age, gender, employment status, and socio-economic status (where associations existed between these variables and the coping variables – see Chapter 6)
Adjusted for age, gender, employment status, socio-economic status, and pain duration (where associations existed between these variables and the coping variables – see Chapter 6)

predictive of pain intensity at 12 months ($p<0.05$). This was partly in-line with the cross-sectional findings (see Chapter 6) in that baseline active behavioural coping was not significantly associated with pain intensity at baseline. However, table 7.1 also shows that baseline cognitive coping was not predictive of pain intensity at 12 months, despite the significant association found between these variables at baseline (see Chapter 6). Of the coping variables that were significant predictors of outcome, catastrophizing was the strongest predictor (ie. the null hypothesis was least likely). The Beta value indicates that as catastrophizing increases by one standard deviation (7.97), pain intensity increases by 0.45 standard deviations. The standard deviation (SD) for pain intensity is 2.58 and so this

constitutes a change of 1.16 points on the pain intensity scale. Therefore, for every 7.97-point increase in catastrophizing score (indicating an increased level of catastrophizing), a 1.16-point increase in pain intensity score is observed (indicating increased intensity of pain). The next strongest predictors of pain intensity were self-efficacy and depression, followed by anxiety, fear avoidance beliefs, and passive behavioural coping.

The second column in table 7.1 shows the associations after adjusting for the following demographic variables that were identified in Chapter 6 as potential confounders due to their significant associations with some or all of the coping variables: age, gender, employment status, and SES. These demographic variables were only controlled for where significant cross-sectional associations existed (see Chapter 6). After adjusting for the demographic variables in the regression model, active behavioural coping became significantly predictive of pain intensity at 12-months follow-up. This could indicate that confounding masked the true relationship between baseline active coping and outcome (pain intensity) shown in the unadjusted results. However, the relationship revealed here as a result of controlling for demographic confounders is weak, given that the 12-month pain intensity score only increased by 0.31 points with one SD increase in baseline active coping score. Therefore although this increase was statistically significant, it is unlikely to be clinically important. Catastrophizing remained the strongest predictor of pain intensity, with only a small decrease of 0.07 in the Beta value following adjustment for demographic variables. This shows that for every 7.97-point increase in catastrophizing, there is a 0.98-point increase in pain intensity score following adjustment for demographic confounders. Although not as strong as catastrophizing, depression and self-efficacy were still strong predictors,

followed by fear avoidance beliefs, anxiety, and passive behavioural coping, therefore mirroring the unadjusted results.

In addition to the demographic variables, ‘pain duration’ (at the time of primary care consultation) was identified in Chapter 6 as an additional potential confounder. Previous research in the area has also shown pain duration to be associated with various coping strategies, further highlighting the potential confounding effects of this clinical variable (Demmelmaier et al, 2008; Hinkley and Jaremko, 1994; Peters et al, 2000; Tsai and Ku, 1997). Seven of the baseline coping variables were cross-sectionally associated with pain duration (see Chapter 6), therefore further linear regression analyses were performed (on these seven variables only) to examine whether these coping variables would still individually predict 12-month pain intensity after controlling for baseline pain duration (in addition to the demographic variables). The third column in table 7.1 shows the associations after adjusting for pain duration and the demographic variables. This reveals that all seven of the coping variables continued to independently predict pain intensity after adjusting for baseline pain duration. With the addition of baseline pain duration into the regression model, the Beta values for most of the variables decreased. However the overall picture remained largely unchanged, with catastrophizing being the strongest independent predictor of outcome (for every 7.97-point increase in catastrophizing, a 0.85-point increase in pain intensity score is now observed). Passive behavioural coping was the only variable to show an increase in Beta value following adjustment for baseline pain duration, suggesting that its true relationship with outcome was previously masked to an extent by confounding by pain duration. This becomes clear when examining the cross-sectional associations between baseline passive coping scores and pain

duration (see Chapter 6, table 6.7). Passive coping did not show a dose response relationship with pain duration – as pain duration increased, passive coping steadily decreased until the three-year point, at which a peak in passive coping was observed. This non-linear association with pain duration could be responsible for the masking of the true relationship between baseline passive coping and 12-month pain intensity. However, the increase in Beta value after controlling for baseline pain duration was small (0.01), equating to only an additional 0.02-point increase in 12-month pain intensity score. The Normal P-P Plot and Scatterplot also revealed no major deviations, indicating that this non-linear association was not of sufficient magnitude to violate the linear regression analysis assumptions.

7.1.2. Controlling for demographic variables, pain duration, and other coping factors

Hierarchical multiple regression analysis is useful where potential confounders have been identified, as it involves entering variables in blocks in a predetermined order to control for possible confounding effects (Pallant, 2007). This technique was used to identify the baseline coping factors that are the most predictive of pain intensity at 12-months follow-up after controlling for demographic variables, pain duration, and other coping factors that were shown to be significant predictors of pain intensity. The variable ‘cognitive coping’ did not independently predict pain intensity, as its predictive effect was shown to be due to confounding. Therefore, this variable was not included in the hierarchical multiple regression analysis performed here. In this case, the possible confounding variables (age, gender, employment status, SES, and pain duration) were entered into the first block,

which has the effect of statistically controlling for them. The other independent variables (i.e. the coping variables) were entered into the second block to determine whether they were still able to explain some of the remaining variance in pain intensity scores at 12 months after the removal of the possible effect of the confounders. Table 7.2 details the hierarchical multiple regression analysis model.

Table 7.2: Summary of the hierarchical multiple regression analysis model

Model	R Square	R Square Change	Sig. F Change	F	Sig.
1	0.242	0.242	0.000	26.891	0.000
2	0.389	0.147	0.000	18.784	0.000

Table 7.2 shows that the model as a whole explains 39% of the variance in pain intensity scores at 12-months follow-up and is therefore a significant model ($F [14, 413] = 18.78$, $p<0.001$). However the principal interest is the additional predictive value of the coping variables. Table 7.2 also shows an R Square Change value of 0.147, revealing that after controlling for the confounding variables, the baseline coping factors explain an additional 15% of the variance in 12-month pain intensity. This is a statistically significant contribution, as indicated by the Sig. F Change value ($p<0.001$). Table 7.3 shows the Beta values for each of the coping variables within the model. Table 7.3 shows that only three of the coping variables were independently predictive of 12-month pain intensity when all other variables were included in the model. Depression was the most predictive of these variables, with a Beta value of 0.18, indicating that for every 4.37-point increase in depression score (indicating an increase in patient depression), a 0.46-point increase in pain intensity score is observed (indicating increased severity of pain).

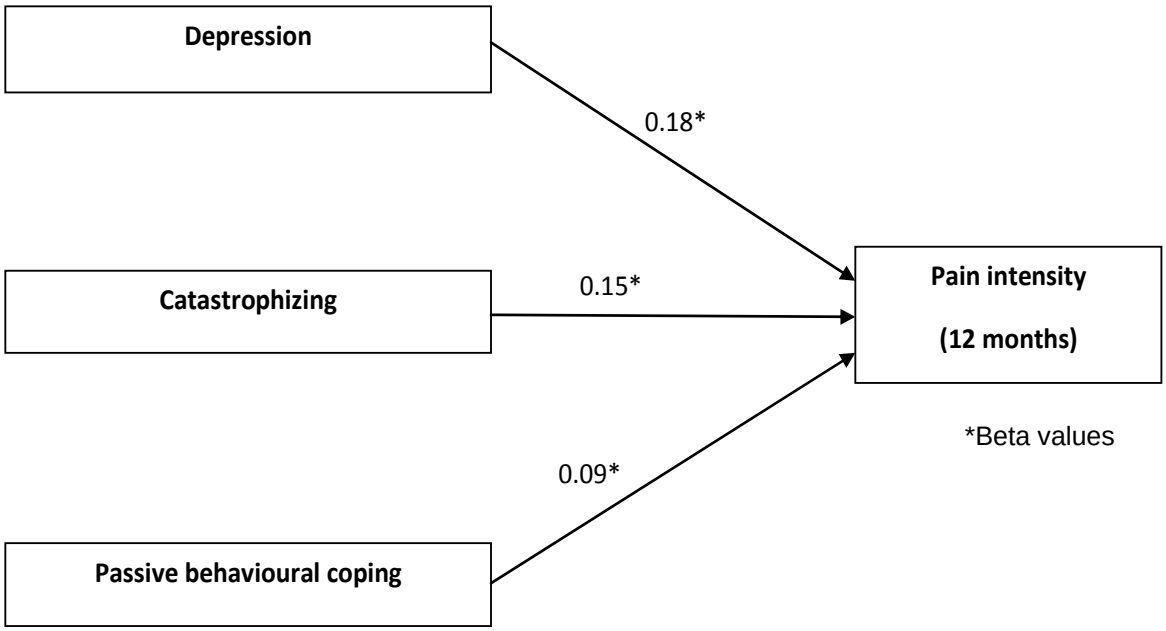
Table 7.3: Relationships between baseline coping variables and pain intensity at 12-months, adjusted for demographic variables, pain duration, and other coping factors

Coping variables	Beta	Sig.
Catastrophizing	0.15	0.007**
Diversion	0.06	0.260
Reinterpretation	0.03	0.603
Active behavioural coping	0.08	0.057
Passive behavioural coping	0.09	0.046*
Fear avoidance beliefs	0.02	0.642
Self-efficacy	-0.11	0.060
Anxiety	-0.08	0.166
Depression	0.18	0.007**

*Beta = significant ($p<0.05$)
**Beta = significant ($p<0.01$)

After depression, the strongest predictor of pain intensity (i.e. for which the null hypothesis was least likely) was catastrophizing, followed by passive behavioural coping. Both depression and catastrophizing were significant predictors of pain intensity at the $p<0.01$ level of significance, indicating that these coping variables were strong predictors of pain intensity. However the Beta value for passive coping was considerably lower, with the p value only just below 0.05. This suggests that the predictive effects of passive coping were weaker than those of depression and catastrophizing (see figure 7.1). Figure 7.1 highlights the three coping variables that emerged from the hierarchical multiple regression analysis model as independent predictors of pain intensity – depression, catastrophizing and passive behavioural coping. However, it is also worth noting that employment status and pain duration emerged as significant independent predictors of pain intensity in the model (Beta = -0.11 and 0.30, respectively) (see Appendix 3, pg. 414). The significance of pain duration in particular was substantial ($p<0.001$), highlighting pain duration as the strongest independent predictor of pain intensity over and above the coping factors.

Figure 7.1: The baseline coping factors that are most predictive of pain intensity at 12-months follow-up



7.2. Predicting disability at 12-months follow-up

This section aims to identify the baseline coping factors that are the most predictive of disability at 12-months follow-up within the BeBack dataset and is structured in an identical way to the previous section. First, the unadjusted associations between baseline coping factors and disability at 12 months are examined. Associations between these variables are then examined whilst controlling for potential confounders (demographic variables and pain duration). Finally, the relationships between the baseline coping variables and disability at 12 months are examined whilst controlling for demographic variables, pain duration, and other coping factors, to reveal which of the coping variables are independently predictive of 12-month disability.

7.2.1. Controlling for demographic variables and pain duration

Baseline disability was found to be cross-sectionally associated with eight out of a possible ten different coping variables (see Chapter 6). Each of the coping variables were examined individually using linear regression analysis to determine whether they were significantly predictive of outcome (disability) at 12-months follow-up. The method of calculating the unadjusted and adjusted Beta values was the same as for pain intensity (see section 7.1.1.). Table 7.4 details the Beta values for each of the coping variables.

Table 7.4: Relationships between baseline coping variables and disability at 12-months

Coping variables	Beta	Beta	Beta
	Unadjusted	Adjusted for demographic variables#	Adjusted for demographic variables and pain duration##
Catastrophizing	0.45**	0.38**	0.33**
Diversion	0.16**	0.11*	0.08
Reinterpretation	0.07	0.07	N/A[1]
Cognitive coping	-0.12*	-0.08	N/A[1]
Active behavioural coping	0.06	0.10*	N/A[1]
Passive behavioural coping	0.34**	0.28**	0.29**
Fear avoidance beliefs	0.37**	0.33**	0.28**
Self-efficacy	-0.53**	-0.45**	-0.41**
Anxiety	0.33**	0.24**	0.21**
Depression	0.49**	0.41**	0.37**

*Beta = significant ($p<0.05$)
**Beta = significant ($p<0.01$)
[1]N/A = adjustment for pain duration was not necessary, as the coping variable was not associated with pain duration (see Chapter 6)
Adjusted for age, gender, employment status, and socio-economic status (where associations existed between these variables and the coping variables – see Chapter 6)
Adjusted for age, gender, employment status, socio-economic status, and pain duration (where associations existed between these variables and the coping variables – see Chapter 6)

The first column in table 7.4 shows the unadjusted Beta values for each of the coping variables. This reveals that eight of the baseline coping variables were predictive of disability at 12 months ($p<0.05$). This was in-line with the cross-sectional findings (see Chapter 6) in that baseline reinterpretation and active behavioural coping were not significantly associated with disability at baseline. Of the coping variables that were significant predictors of disability at 12 months, self-efficacy was the strongest predictor (i.e. the null hypothesis was least likely). The Beta value indicates that as self-efficacy increases by one standard deviation (14.56), disability decreases by 0.53 standard deviations. The SD for disability is 6.12 and so this constitutes a change of 3.24 points on the disability scale. Therefore, for every 14.56-point increase in self-efficacy score (indicating an improvement in self-efficacy), a 3.24-point decrease in disability score is observed (indicating an improvement in disability). The next strongest predictors of disability were depression and catastrophizing, followed by fear avoidance beliefs, passive behavioural coping, and anxiety.

As with pain intensity, the second column in table 7.4 shows the associations after adjusting for the demographic variables. This reveals that cognitive coping was no longer significantly predictive of outcome (the predictive effects identified by the unadjusted results were probably due to possible confounding by demographic factors). As with pain intensity, active behavioural coping became significantly predictive with the addition of the demographic variables into the regression model. This supports the suggestion that confounding masked the true relationship between baseline active coping and outcome shown in the unadjusted results. However, the relationship revealed here as a result of controlling for demographic confounders appeared to be weak, given that the 12-month disability

score only increased by 0.61 points with one SD increase in baseline active coping score. Therefore although this increase was statistically significant, it may not be clinically important. Self-efficacy remained the strongest predictor of disability, with only a small decrease of 0.08 in the Beta value following adjustment for demographic variables. This shows that for every 14.56-point increase in self-efficacy, a 2.75-point decrease in disability score is now observed following adjustment for demographic confounders. When compared with the Beta value for active behavioural coping, we can clearly see a difference in this point increase. e.g. for every 0.92-point increase (i.e. one SD) in active coping, only a 0.61-point increase in 12-month disability score is observed. Although not as strong as self-efficacy, depression and catastrophizing were still strong predictors, followed by fear avoidance beliefs, passive behavioural coping, and anxiety. The ordering of these predictors by strength remained unchanged after adjusting for the demographic variables.

Further linear regression analyses were performed to examine whether the coping variables would still uniquely predict 12-month disability after controlling for baseline pain duration, in addition to the demographic variables. These analyses were only performed on the seven coping variables that were found to be cross-sectionally associated with pain duration (see Chapter 6). The results of these analyses are presented in the third column in table 7.4. This reveals that six out of the seven coping variables continued to independently predict disability after adjusting for baseline pain duration. Only the identified predictive effects of diversion appear to be due to the confounding variable ‘pain duration’. After adjusting for baseline pain duration as well as the demographic variables, the Beta values for most of the variables decreased. However the overall picture remained

the same, with self-efficacy being the strongest independent predictor of outcome (for every 14.56-point increase in self-efficacy, a 2.51-point decrease in disability score is now observed). Passive behavioural coping was the only variable to show an increase in Beta value following adjustment for baseline pain duration, suggesting that its true relationship with disability at 12 months was previously masked to an extent by confounding by pain duration. As with the findings for pain intensity (see section 7.1), it may be the non-linear association between passive coping and pain duration (see Chapter 6, table 6.7) that is responsible for masking the true relationship between baseline passive coping and 12-month disability. However, the increase in Beta value after controlling for baseline pain duration was small (0.01), equating to only an additional 0.06-point increase in 12-month disability score.

7.2.2. Controlling for demographic variables, pain duration, and other coping factors

Demographic variables, pain duration, and other coping factors were all controlled for using hierarchical multiple regression analysis to identify the baseline coping factors that are the most predictive of disability at 12-months follow-up. The level of colinearity between the coping variables was within an acceptable range and therefore did not violate the assumptions for regression analysis (see Chapter 6). Three variables (reinterpretation, cognitive coping, and diversion) did not independently predict disability, therefore these variables were not included in the subsequent analysis performed here. Variables entered into the first block as

potential confounders were the same as for pain intensity (see section 7.1.2.). Table 7.5 details the hierarchical multiple regression analysis model.

Table 7.5: Summary of the hierarchical multiple regression analysis model

Model	R Square	R Square Change	Sig. F Change	F	Sig.
1	0.263	0.263	0.000	30.686	0.000
2	0.464	0.201	0.000	30.439	0.000

Table 7.5 shows that the model as a whole explains 46% of the variance in disability scores at 12-months follow-up and is therefore a significant model ($F [12, 422] = 30.44$, $p<0.001$). However the principal interest is the additional predictive value of the coping variables. Table 7.5 also shows an R Square Change value of 0.201, revealing that after controlling for the confounding variables, the baseline coping factors explain an additional 20% of the variance in 12-month disability. This is a statistically significant contribution, as indicated by the Sig. F Change value ($p<0.001$). Table 7.6 shows the Beta values for each of the coping variables within the model.

Table 7.6: Relationships between baseline coping variables and disability at 12-months, adjusted for demographic variables, pain duration, and other coping factors

Coping variables	Beta	Sig.
Catastrophizing	0.08	0.111
Active behavioural coping	0.07	0.063
Passive behavioural coping	0.13	0.001**
Fear avoidance beliefs	0.07	0.130
Self-efficacy	-0.19	0.000**
Anxiety	-0.11	0.048*
Depression	0.22	0.000**

*Beta = significant ($p<0.05$)
**Beta = significant ($p<0.01$)

Table 7.6 shows that four of the coping variables were independently predictive of 12-month disability when all other variables were included in the model. Depression was the most predictive of these variables (i.e. the null hypothesis was least likely), with a Beta value of 0.22, indicating that for every 4.37-point increase in depression score (indicating an increase in patient depression), a 1.35-point increase in disability score is observed (indicating increased disability). After depression, the strongest predictors of disability were self-efficacy, passive behavioural coping and anxiety. Depression and self-efficacy appeared to be strong predictors of disability, as shown by their high Beta values and significance below the 0.01 level. The Beta value for passive coping was somewhat lower, however it still reached a significance of $p<0.01$, indicating that passive coping was still a strong predictor of disability although not quite as strong as depression and self-efficacy. The predictive effects of anxiety however were substantially weaker, with a Beta value of less than half that reported for depression, and a p value only just below 0.05 (see figure 7.2).

Figure 7.2: The baseline coping factors that are most predictive of disability at 12-months follow-up

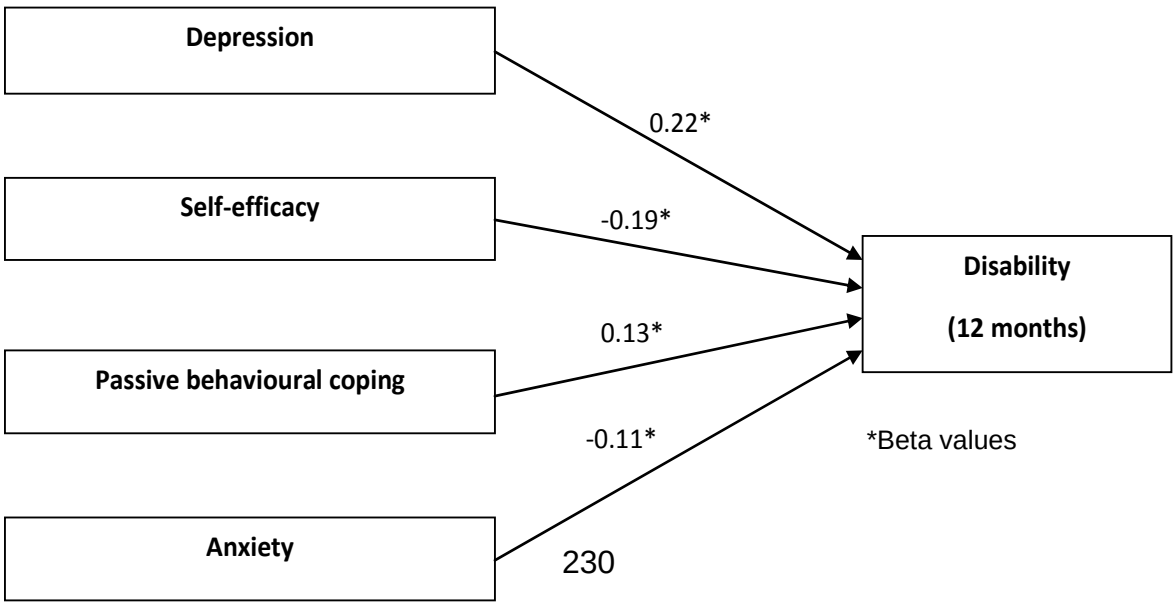


Figure 7.2 highlights the four coping variables that emerged from the hierarchical multiple regression analysis model as independent predictors of disability – depression, self-efficacy, passive behavioural coping and anxiety. However, it is worth noting here that employment status and pain duration again emerged as significant independent predictors in the model (Beta = -0.14 and 0.30, respectively) (see Appendix 3, pg. 416). As for pain intensity, pain duration was found to be by far the strongest independent predictor of disability over and above the coping factors ($p<0.001$). It is also worth noting that although anxiety is generally reported to predict increased disability scores (Jensen et al, 2010), the results here indicate that higher levels of anxiety at baseline were actually predictive of lower 12-month disability scores. Therefore the predictive effect of anxiety observed here was not in the expected direction. This surprising finding, a possible anomaly, is discussed further in Chapter 8.

7.3. A comparison of the coping variables that are predictive of pain intensity and disability

Section 7.1 identified three important baseline coping variables that predicted 12-month pain intensity, and section 7.2 identified four important baseline coping variables that predicted 12-month disability. Figure 7.3 summarises these predictors and their relationships with patient outcomes.

Figure 7.3: Baseline coping factors that are predictive of pain intensity and disability at 12-months follow-up

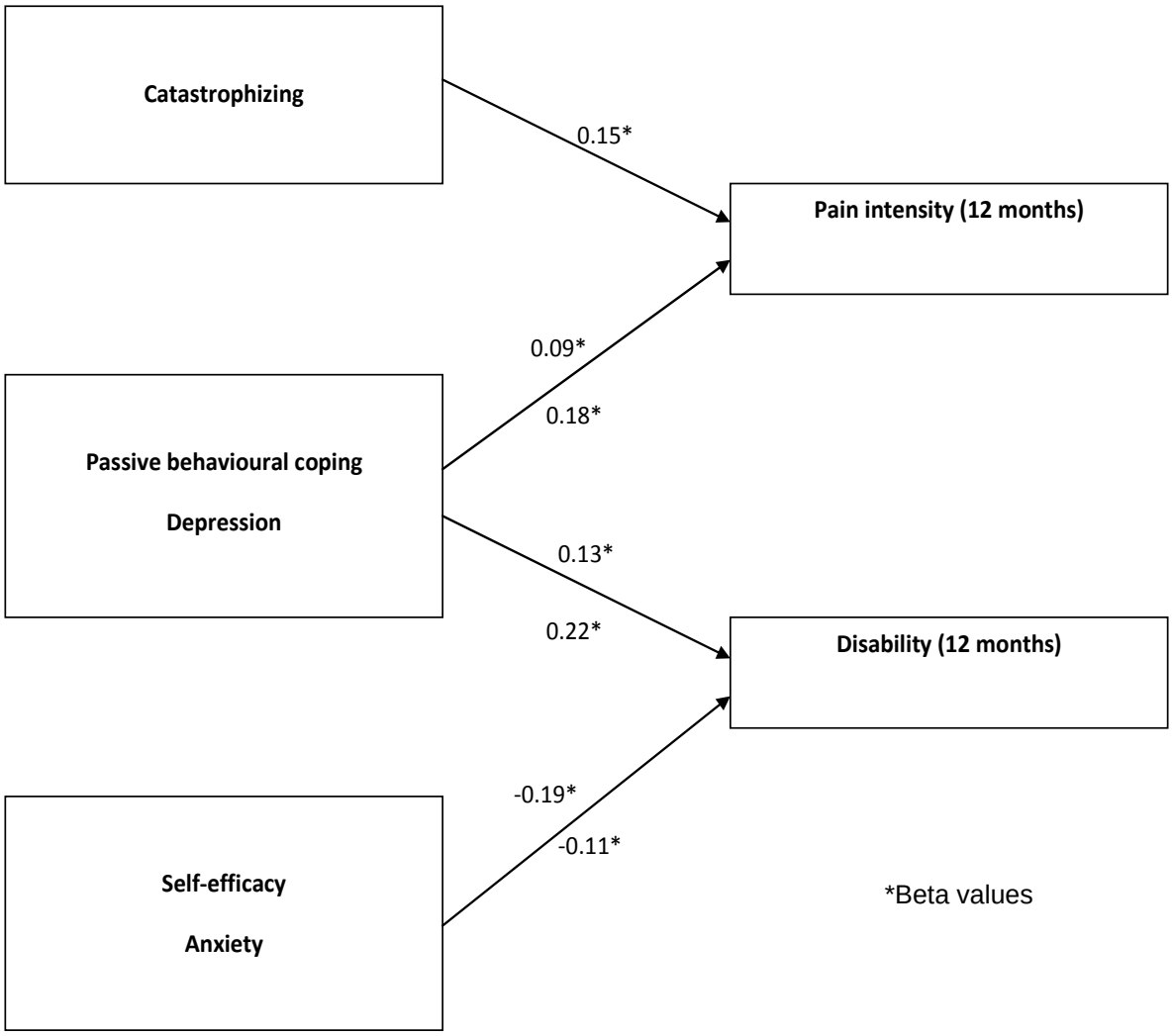


Figure 7.3 clearly shows that although some of the same baseline coping variables are predictive of both pain intensity and disability at 12 months (i.e. passive coping and depression), there are also some coping variables that are predictive of only pain intensity or disability. Utilising the definition of the overall concept of 'coping' that was proposed in Chapter 1 of this thesis further highlights the differences in the prediction of these outcomes. Pain intensity can be predicted by both cognitive and behavioural coping strategies (catastrophizing and passive behavioural

coping), and the mood factor ‘depression’, whereas disability is predicted by behavioural coping strategies (passive behavioural coping), mood factors (depression and anxiety), and self-efficacy beliefs. This demonstrates the importance of coping strategies, mood, and beliefs in the prediction of low back pain outcome.

7.4. Discussion

This chapter investigated which baseline coping factors are independent predictors of pain and disability at 12-months follow-up after primary care consultation for low back pain. The systematic review that was conducted earlier in this thesis (see Chapter 2) identified fear avoidance beliefs as the most important (in terms of consistency and volume of research findings) risk factor for poor low back pain outcome, with passive coping, depression, catastrophizing, anxiety, negative affect, and self-efficacy also emerging as possible indicators. The findings of this chapter add to those review findings by identifying independent predictors of low back pain outcome in a large prospective cohort of primary care patients.

7.4.1. Predicting pain intensity and disability

Unadjusted associations between baseline coping variables and 12-month pain intensity/disability were in-line with the cross-sectional associations reported in Chapter 6. The only exception was that baseline cognitive coping was found to be associated cross-sectionally with pain intensity, but was not predictive of 12-month

pain intensity. Catastrophizing was the strongest predictor of pain intensity, whereas self-efficacy was the strongest predictor of disability. These variables remained the strongest predictors once other variables were controlled for.

7.4.1.1. Results after controlling for demographic variables

Adding the demographic variables into the model revealed that the predictive effects of cognitive coping on disability that were identified by the unadjusted results were influenced by confounding. Chapter 6 showed cognitive coping to be significantly associated with age, employment status, and SES, therefore any of these variables (or indeed a combination) could have had an influence on the relationship reported here between cognitive coping and disability. Adding the demographic variables into the model also revealed significant relationships between active coping and pain intensity and disability. It would appear that the true relationships between these variables were masked by confounding. Chapter 6 showed that active coping was associated with both employment status and socio-economic status (SES), with employed patients and those of higher SES utilising higher levels of active coping. There are a number of possible explanations for this. It may be that those patients who were currently employed were managing to cope in a more active way as a result of their employment status. For example, Popham and Mitchell (2007) stated that their findings showed the importance of employment as a source of physical activity, and that “those in active employment, especially full time, are very likely to meet the recommended level of activity” (pg.184). Bartley and Plewis (2002) also reported that employment was a likely source of activity. It is also possible therefore that those patients who

managed to remain in employment despite their low back pain had pain problems that were less severe and they were therefore more able to cope in an active manner, as people perceive illness and disability as barriers to engaging in physical activity (Chinn et al, 1999). In addition, low SES adults are more likely to be in poor health (Bartley et al, 2004; Lawlor et al, 2005), which may affect their engagement in both employment and physical activity. This could explain why studies have reported a link between socioeconomic disadvantage and higher rates of little or no physical activity such as brisk walking, sport, and exercise (Pitson, 2000; Popham and Mitchell, 2007). Furthermore, it is also possible that those patients of a higher SES had the means to fund a more active lifestyle and therefore generally demonstrated more active behaviours, as cost has been identified by people of lower SES as a potential barrier to participation (Chinn et al, 1999). Finally, high levels of inactivity amongst people of lower SES have been found to be related to low levels of education (e.g. to understand that active behaviours are beneficial) and possible negative attitudes towards physical activity (Phillips and Ginn, 2001). These associations might have subsequently masked the relationships between active coping and pain intensity, and active coping and disability, which were revealed when the demographic variables were controlled for.

7.4.1.2. Results after controlling for demographic variables and pain duration

After controlling for pain duration (in addition to the demographic variables), all of the seven coping variables that were cross-sectionally associated with pain duration remained independently predictive of pain intensity at 12 months, but only

six of these variables remained uniquely predictive of disability. The predictive effects of diversion were due to confounding by pain duration. The relationships between passive coping and pain intensity/disability were masked to a certain extent by pain duration as a confounding variable, as passive coping showed an increase in Beta value following adjustment for pain duration. It is possible that the non-linear association reported between passive coping and pain duration (see Chapter 6) might be responsible for this and that the observed peak in passive coping at the three-year point might be particularly important. This change in coping at the three-year point has also been reported by other researchers, who have found important differences in low back pain outcomes between people who recall more or less than three years duration (Dunn and Croft, 2006). These findings led to Dunn and Croft (2006) suggesting that patients could be grouped according to their pain duration being above or below this three-year cut-off point. This is an interesting and novel avenue requiring further research in order to fully understand the impact of the proposed three-year pain duration cut-off. The results found here confirm that it might be beneficial for further research examining passive coping or change in passive coping over time to separate patients into two groups by pain duration (using the three-year cut-off point), in order to more accurately account for the differences in pain duration that might be influencing the effect of passive coping on patient outcome.

7.4.1.3. Which coping variables are independent predictors of low back pain outcome?

To determine which variables were independent predictors of outcome and the relative strength of these predictors, it was necessary to combine all the coping

variables with the demographic variables and pain duration into multiple regression models. Only three of the coping variables remained significant independent predictors of pain intensity – depression, catastrophizing, and passive behavioural coping – whereas only four of the coping variables remained significant independent predictors of disability – depression, self-efficacy, passive behavioural coping, and anxiety. These results are in-line with conclusions of the systematic review (see Chapter 2). The one major deviation from previous findings is that fear avoidance beliefs (identified by the systematic review as the most important risk factor for poor outcome) were not significantly predictive of either pain intensity or disability here. This was an unexpected finding due to the volume of studies indicating its importance, however Foster et al (2010) also found that when other independent factors were included in a multivariate model, fear avoidance beliefs were no longer significant. They stated that this showed clear redundancy in the measurement of psychological factors, thus suggesting that the predictive effects of fear avoidance beliefs can be accounted for by other coping factors. In support of this, the majority of studies included within the systematic review focused only on a limited number of predictive factors (see Chapter 2), hence failing to expose the potential of redundancy of fear avoidance beliefs as a predictor of low back pain outcome and therefore raising a question about the utility of the fear avoidance model (Vlaeyen et al, 1995) in this population. All the other coping variables identified here were also highlighted by the systematic review as important predictors of outcome except for passive behavioural coping, as its measurement was newly developed within this thesis (see Chapter 4). However the systematic review did highlight the importance of passive cognitive coping, which could be related to passive behavioural coping.

7.4.1.4. How much of the variance in low back pain outcomes is explained by the independent predictors?

The coping variables were shown to explain an additional 15% of the variance in 12-month pain intensity once the demographic variables and pain duration were controlled for, and an additional 20% of the variance in 12-month disability. This represents a statistically significant contribution in both cases. When combined with the demographic and clinical variables, the model was able to predict 39% of the variance in pain intensity, and 46% of the variance in disability. These percentages are relatively high compared to recent prognostic studies in the field, which have reported regression models explaining between 24% and 40% of the variance in pain, disability, quality of life, and sick leave (Ayre and Tyson, 2001; Johansson et al, 2010), and explaining an additional 5% to 32% of the variance in pain intensity and disability after controlling for confounders (Woby et al, 2007; Woby et al, 2005). Therefore the additional 15% to 20% of the variance explained here by the coping variables could be clinically important. For example, if pain management interventions were developed to successfully target these factors then it is possible that this 15% to 20% contribution to pain and disability outcomes could lead to significantly better low back pain patient outcomes. However, the results of this chapter also highlight the need to consider demographic and clinical variables in addition to coping factors in an attempt to improve pain management interventions. This chapter has indicated that the coping variables that might be important to target in interventions include catastrophizing, passive behavioural coping, depression, self-efficacy and anxiety in order to improve low back pain outcomes. There are several established intervention methods that could be used to target these factors. Cognitive behavioural therapy is one such method, aiming

to solve problems concerning dysfunctional emotions, behaviours and cognitions through goal-oriented, operant-based interventions that have been effective in reducing pain responses (Sanders, 2006; Turner and Clancy, 1986). Other intervention methods include pain coping skills training, and biofeedback, which involves making patients aware of various physiological functions in order to try to control pain perception and brainwaves (Kayiran et al, 2007; Newton-John et al, 1995). In addition to these methods, exercise and/or medication (i.e. antidepressants) could be used to alleviate depression (Ko, 2007).

7.4.1.5. Closer theoretical examination of the independent predictors

It was found that both cognitive and behavioural coping strategies, along with mood factors, were predictive of low back pain outcome 12 months after primary care consultation. Therefore, it is important to consider these variables for inclusion within assessment methods and treatment programmes. When combined as predictors of pain intensity, the three individual coping variables can be seen to reflect an overall negative style of coping, where the amalgamation of negative thoughts about low back pain in the future (catastrophizing), low mood (depression), and negative behaviours (passive coping) result in a significantly higher self-reported pain intensity score at 12-months follow-up. It is important to note however, that none of the cognitive coping strategies were uniquely predictive of 12-month disability. Rather, it was the behavioural coping strategies, mood, and belief factors that were predictors.

It is perhaps helpful to distinguish positive and negative factors, thus the coping factors that were predictive of disability can be divided into two categories; positive

factors resulting in lower self-reported 12-month disability scores, and negative factors resulting in higher self-reported 12-month disability scores. It is likely that the negative coping factors (depression and passive coping) are responsible for decreased patient physical activity, which has been shown in turn to result in the 'disuse' syndrome, where decreased activity leads more easily to pain and physical discomfort, making avoidance more likely (Vlaeyen et al, 1995).

It is unsurprising that pain self-efficacy emerged as a significant positive coping factor, as previous research has shown it to be related to higher pain thresholds and tolerance (Keefe et al, 1997), emotional adjustment to chronic pain (Sarda et al, 2007), improvement in physical performance (Adegoke et al, 2010), and fewer negative outcomes (Keefe et al, 2004). According to social learning theory, self-efficacy beliefs significantly influence the initiation and persistence of behaviour (Bandura, 1986), suggesting that self-efficacy might have an important impact on the continued attempts patients make to change their behaviour and the way in which they cope with their pain. All these factors have an effect on patient disability and it is likely that those patients with higher levels of pain self-efficacy engage in more active behaviours and attempts to get on with their normal everyday life and activities despite their low back pain, and are therefore subsequently less disabled. However, active behavioural coping did not emerge as significantly predictive of either pain intensity or disability 12 months after primary care consultation here. One possible explanation for this is that the measure of active behavioural coping developed within this thesis is not accurately measuring the active behaviours that are important in the prediction of low back pain outcome (see Chapter 4 for an examination of the limitations of the behavioural coping measure).

In addition, it was surprising to find in this dataset that anxiety was an independent predictor of disability, and was in fact a positive coping factor. Anxiety is not usually considered to be a positive factor, and previous research has shown that it is generally predictive of increased disability scores (Jensen et al, 2010). However it has emerged here, along with self-efficacy, as a positive coping factor. One possible explanation for this unexpected finding is that patients with higher levels of anxiety are generally more worried or concerned about their back problem and will therefore engage in increased coping attempts in order to try to alleviate or manage their back pain problem, leading to lower levels of disability. In addition, McCracken and Gross (1993) found that different types of anxiety have different relationships with pain coping responses. They found that cognitive anxiety symptoms (e.g. interference with cognitive functioning) can interfere with coping, whereas physiological anxiety symptoms (e.g. autonomic arousal responses) can actually enhance coping (McCracken and Gross, 1993). Therefore it is also possible that physiological symptoms of anxiety could explain the positive effects reported here. However it is also important to note that the Beta value for anxiety was small in magnitude and, overall, of questionable clinical importance in comparison to the other predictors. This surprising finding could therefore also be an anomaly in the data. This cannot be confirmed in this dataset, and further research is necessary to investigate in more detail the effect of anxiety on low back pain outcome in primary care.

7.4.1.6. The significance of employment status and pain duration

Employment status and pain duration were also shown to be significant independent predictors of pain intensity and disability, with pain duration emerging as a stronger predictive factor than any of the coping variables. It is clear from these findings that the duration of the current back pain episode reported by patients at baseline is important in predicting their outcome 12 months later, and this has also been reported by several other studies of prognostic factors for low back pain outcome (Bekkering et al, 2005; Skovron, 1992). However, it is possible that pain duration might just be reflecting the stage a patient is at in the natural history, or 'trajectory', of their pain problem. It is possible that pain problems follow a relatively stable, pre-determined trajectory with little deviation in course and outcome (Croft et al, 2006; Dunn et al, 2006; Hayden et al, 2010), and therefore the point at which patients consult in primary care might be determined by their specific pain trajectories. Therefore, it is important for future research on prognostic factors to examine how these factors change over time and in what way this change impacts on low back pain outcome. It is also important for future studies to be conducted with much longer follow-up periods, as 12 months is a relatively short time in the overall lifetime course of low back pain and might not facilitate full investigation of the influence of pain duration and pain trajectories.

7.4.1.7. Comparing pain intensity and disability as outcomes of low back pain

When the predictors of both pain intensity and disability were compared (see section 7.3), some similarities were found. Passive coping and depression

predicted both greater pain intensity and greater disability, indicating that these predictor variables have a negative overall effect on several low back pain outcomes. However, several differences between the predictors also emerged, highlighting the differences between the two outcome variables. Although pain intensity and disability are linked and are often highly correlated (Jensen et al, 2010), with pain intensity reported to be the greatest predictor of disability, there are other factors involved in the relationship between pain and disability (Arnstein et al, 1999), suggesting that they are separate variables reflecting different aspects of low back pain outcome. The differences in the identified predictors of these two outcome variables support this assumption, and appear intelligible when we examine the differences between pain and disability themselves. A pain intensity score is a subjective interpretation/rating of the pain felt by an individual and is therefore cognitive in nature, whereas a disability score is a self-reported score of the functional limitations experienced by an individual with their everyday activities and is therefore rather more behavioural in nature, as it reflects on the behaviours a patient is performing in their day to day lives. Thus, with regard to the variable ‘catastrophizing’, it is probable that a patient reporting high levels of catastrophic thoughts will be focusing more on the intensity of their pain and its likelihood of persistence in the future, resulting in despair and ultimately higher ratings of intensity, but this would not necessarily directly affect their reported disability. It also appears logical that pain self-efficacy expectations would emerge as a predictor of disability and not pain intensity. Pain self-efficacy, although being essentially a cognitive coping variable, relates to an individual’s confidence in their ability to get on with their life, including their everyday activities and hobbies, despite their pain. So individuals with high pain self-efficacy are more confident in

their ability to manage, despite their pain, perhaps resulting in them trying harder to cope and function. Therefore this will inevitably affect their disability scores but not necessarily their pain intensity scores. Thus despite the often assumed link between the two outcome variables (i.e. higher pain intensity associated with greater disability), it is important to remember that these variables reflect different aspects of low back pain outcome and that they should therefore be examined separately in future research. It is also important to note that this differentiation between the two outcome variables suggests that it is possible for treatment programmes to target one outcome variable without necessarily affecting the other. For example, it is plausible that patient disability could be targeted and potentially reduced without an accompanying reduction in pain intensity. In support of this, Loisel et al (2001) called for a change in paradigm from back pain prevention and treatment to disability prevention and management. This could be a good treatment outcome for many chronic pain patients (i.e. those who continue to experience pain for long periods of time with little change), and future research should develop and test appropriate interventions to determine whether these outcomes can be achieved.

7.4.2. Adjusting for baseline pain intensity and disability

Researchers do not always conform to a standard procedure regarding examination of predictor variables in this type of analysis (Nyiendo et al, 2001; Woby et al, 2005). Given that there is no consensus as to whether researchers should or should not adjust for outcome variables at baseline, not all research of this kind will be comparable. Both methods of analysis were explored for this

thesis chapter (i.e. adjusted and unadjusted for baseline pain intensity and disability), and the subsequent results of these analyses were somewhat different. The most notable differences were that passive coping and self-efficacy were no longer significantly predictive of either outcome when baseline pain intensity/disability were taken into account. In addition, depression was no longer predictive of 12-month pain intensity, whereas anxiety became significantly predictive. There are clearly important differences in the results of these different methods of analysis, with a greater number of coping factors emerging as predictors of pain intensity and disability when these outcome variables (at baseline) are not adjusted for.

Prior to the analysis of any data for this thesis chapter, the decision was taken that baseline pain intensity and disability would not be adjusted for when analysing which of the coping factors were significant predictors of outcome at 12 months follow-up. This decision was therefore unbiased, as it was not influenced in any way by the subsequent results. The basis of this decision was methodological, as it was felt that baseline pain intensity and disability were not true confounders of the potential relationships between the predictors (coping factors) and outcome, and that adjustment for baseline pain intensity and disability could bias the association between the predictors and these outcome variables (Rothman et al, 2008).

One advantage of not adjusting for baseline pain intensity or disability is that the findings are arguably more clinically relevant with regard to potentially shaping the focus, content and processes of clinical interventions. It is more clinically useful to identify these factors regardless of baseline pain intensity or disability. Although pain and disability are frequently discussed within primary care consultations, GPs

do not usually have the time to provide a comprehensive assessment of pain intensity and disability using rating scales and established measurement instruments. Therefore these baseline levels often go unreported. It therefore seems more efficacious for healthcare professionals to be able to identify prognostic factors for poor low back pain outcome without having to control for baseline levels of pain intensity and disability. This would enable the inclusion of all patients within targeted pain management interventions, not just those with documented baseline levels of pain intensity and disability. In addition, if the identification of baseline levels of pain intensity and disability was not necessary, this would require the completion of fewer self-report measures by patients and would lead to quicker assessment and targeting of interventions for all patients.

7.4.3. Chapter summary

The aim of this chapter was to determine which coping factors are independently predictive of pain and disability at 12 months follow-up in primary care low back pain patients. The results presented here identified three coping variables that independently predicted pain intensity (depression, catastrophizing and passive behavioural coping), and four coping variables that independently predicted disability (depression, self-efficacy, passive behavioural coping and anxiety). The following chapter (see Chapter 8) will examine these variables more closely to investigate how they impact on low back pain outcome, focusing on whether change in these coping variables over time is important.

8. Does change in coping with low back pain over time predict future pain and disability?

This chapter aims to examine whether change in coping over time (specifically looking at the five coping factors that emerged as important independent predictors of low back pain outcome in the previous chapter) is predictive of future low back pain outcome (pain and disability at 12 months follow-up), and to determine whether baseline pain duration impacts on this relationship. This will help to determine whether it is the baseline level of coping that predicts 12-month pain and disability, or whether it is the change in coping from baseline to follow-up that predicts patient outcome. This is important to know in order to inform clinical interventions (for example, to help decide if we should be targeting patient coping early, within the primary care consultation, or later at follow-up points).

This chapter will begin by identifying what is an important change in coping over time. It will then examine the numbers of patients whose coping changed over time, the patterns of change across the coping variables, and the other factors that might affect this change over time. Following this, relationships between change in coping over time and low back pain outcomes will be examined, and predictive effects of coping change will be highlighted. Chapter 7 found that pain duration was by far the strongest independent predictor of pain intensity and disability over and above the coping variables, therefore it was felt that this provided the justification for a more detailed examination of pain duration. This chapter will therefore also examine pain duration, to determine whether it can significantly predict change in coping over time.

8.1. Whose coping changes over time and how?

This section will begin by outlining how an important increase or decrease in coping can be identified. It will then examine which patients in the BeBack dataset showed an important increase or decrease in coping from baseline to 12 months follow-up, highlighting any patterns of change that emerge.

8.1.1. Identifying an important increase or decrease in coping

In order to examine whether change in coping over time is significantly associated with low back pain patient outcome at 12 months, a method of identifying important increases/decreases in coping must first be established. Current literature suggests that there are two approaches to establishing the smallest meaningful or important change for an individual, either distribution-based or anchor-based methods (de Vet et al, 2006; 2007; Jordan et al, 2006). Distribution-based methods are based on the statistical characteristics of the sample and express the observed change in a standardised metric such as the effect size, standardised response mean, and standard error of measurement (de Vet et al, 2006). Anchor-based methods compare changes in scores on the instrument with an anchor (often a single question such as patient ratings of overall change), but these methods have several associated limitations, including bias, validity and reliability issues, and failure to take into account the variability of the instrument and/or the sample (de Vet et al, 2007; Jordan et al, 2006). For these reasons, distribution-based methods are seen as preferable

(Jordan et al, 2006). In addition, it would not be possible to adopt an anchor-based method within this thesis because there is no available anchor for some of the measurement instruments used (e.g. the newly developed measure of behavioural coping). Therefore, a distribution-based method was adopted here.

Change scores were calculated for each patient on the five coping factors shown to be independent predictors of low back pain outcome by subtracting the baseline score from the 12 month follow-up score. These change scores were then examined to determine the extent of the increase or decrease in coping over the 12 months. There is currently no universally agreed method of determining an important change in coping, therefore researchers wishing to do this must examine the literature and make an informed decision about the particular merits of different methods. Several distribution-based methods have been proposed in recent years (de Vet et al, 2007; 2006), however Norman et al (2003) conducted a systematic review of 38 studies and discovered a consistent method of determining what they referred to as the 'minimal important difference'. They reported that from the studies examined, estimates of a threshold of minimal important difference were consistently close to approximately one half of the standard deviation (SD) at baseline, and they found that this held for generic and disease-specific measures, and that it was not dependent on the number of response options. They demonstrated that the range of estimates for the minimal important difference expressed in SD units corresponded almost exactly to the limit of human discrimination identified by Miller (1956) in his classic article "The Magic Number Seven Plus or Minus Two". In this article, Miller (1956) concluded that this uniformity was the result of a fundamental characteristic of human information

processing that related to limits on short-term memory. The comparisons between the findings of Miller (1956) and Norman et al (2003) provided the justification for Norman et al (2003) to report that the 0.5 SD method is “not an arbitrary statistical criterion but is empirically derived, based on psychological theory” (pg. 590). However, this approach has since been criticised by de Vet et al (2006), who argued that it corresponds more to minimally detectable difference than to minimally important difference. Norman et al (2003) did explore this point within their systematic review, finding that differences between minimal important difference and detectable difference (in means and SDs) were not significant. This should go some way to counter the criticism of de Vet et al (2006). It is also important to note that using a method of minimal detectable difference might actually be more relevant in the context of this thesis (focusing on multiple coping and outcome measures rather than on trials with a single measure). Therefore Norman et al’s (2003) 0.5 SD criterion might be appropriate for use within this thesis, despite the potential issue of it corresponding more to minimal detectable difference than to minimal important difference. In addition, as there is no clear data on what constitutes a minimal important difference in the coping variables, it is reasonable to utilise a standard criterion of minimal detectable difference such as the 0.5 SD method.

Norman et al (2003) argued that the 0.5 SD criterion is based on a sounder psychological and empirical foundation than the accepted 0.05 convention for statistical significance, therefore it is plausible to expect that the 0.5 SD criterion could become equally accepted over time. Until then however, Norman et al (2003) stated that it would be appropriate to consider the 0.5 SD method as an approximate rule of

thumb, and that it could ultimately be viewed as a default value unless other evidence comes to light. The method was therefore adopted within this thesis, and if the extent of the increase or decrease in coping over time was equal to or greater than half a SD (at baseline) on the particular measurement instrument then it was classified as a detectable change in coping over time. Those patients whose increase or decrease in coping was less than half a SD were classified as 'non-changers', as their level of change was below the cut-off used here. These patients subsequently formed the 'no change' group. Table 8.1 shows the number of patients within each change group for the five coping variables that were identified in Chapter 7 as important predictors of low back pain outcome (anxiety, depression, catastrophizing, self-efficacy and passive behavioural coping).

Table 8.1: Summary of numbers (and proportions) of patients in each coping change group

	Change group*		
	Increase	**Decrease**	**No change**
Anxiety	48 (10.5%)	183 (40.1%)	225 (49.3%)
Depression	50 (11.0%)	147 (32.3%)	258 (56.7%)
Catastrophizing	57 (16.1%)	142 (40.1%)	155 (43.8%)
Self-efficacy	103 (29.3%)	47 (13.4%)	202 (57.4%)
Passive coping	148 (32.2%)	173 (37.7%)	138 (30.1%)

*Change determined by an increase/decrease of at least half a standard deviation (at baseline) (Norman et al, 2003)

Table 8.1 shows that for each coping variable, the highest percentages of patients were found in the 'no change' groups, with the exception of passive coping. This is apparent across the four remaining coping variables, with between 43.8% and 57.4%

of patients belonging to the ‘no change’ group. However for many patients, there was a change in coping over time. For these patients, it would appear that anxiety, depression, catastrophizing, and passive coping were more likely to decrease over the 12 month period since primary care consultations (between 32.3% and 40.1% decreased compared to between 10.5% and 32.2% increased). Self-efficacy was more likely to increase over time (29.3% of patients compared to 13.4% who decreased).

Depression, catastrophizing and passive coping are negative coping factors, in that they are predictive of poorer low back pain outcomes, whilst self-efficacy is a positive coping factor in that it predicts better low back pain outcomes. There is a question mark over the direction of anxiety, as it is generally regarded as a negative coping factor but it emerged as positive in the previous chapter (see Chapter 7). Here, it appears to follow the same pattern as the negative coping factors, therefore it will be grouped with these factors for the purpose of the following section examining patterns of change. However, this problem will be kept in mind and examined further within the following section (see section 8.1.2.).

Increases in negative coping and decreases in positive coping reflect poorer coping over time, whereas decreases in negative coping and increases in positive coping reflect better coping over time. Table 8.1 shows that overall, more patients with low back pain in primary care improve over time in terms of coping (as evidenced by increases in positive coping factors such as self-efficacy, and decreases in negative coping factors such as catastrophizing) rather than worsen.

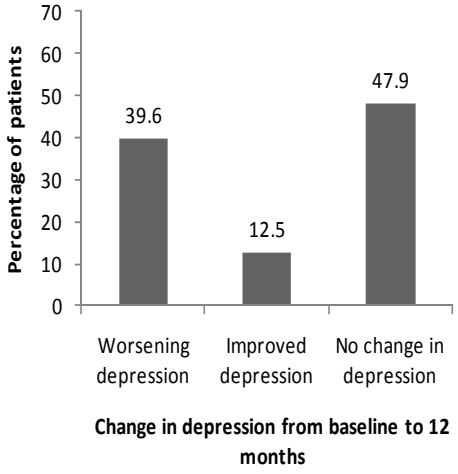
8.1.2. Patterns of change

It is important to compare how patients changed across all five of the coping variables in addition to examining change in each variable individually, in order to help provide a clearer picture of the patterns of change for individual low back pain patients. To examine overall patterns of coping change over time, the percentage of patients who improved or worsened on all five of the coping variables was calculated. This revealed that very few patients changed in the same direction across all of the five coping variables (4.3% improved and 0.9% worsened) from baseline to 12 months follow-up. For coping improvement, a relatively large percentage of patients improved on two coping variables (21.7%), with improvement on three variables falling to 12.7%. For coping worsening, only 13.3% of patients showed worsening on two variables, with considerably smaller percentages of patients worsening on three or more variables (5.8% on three variables, falling to 2.6% on four variables). This was in part due to the large percentage of patients who showed no deterioration in coping at all (44.5%). This is a positive finding, again showing that overall, more patients with low back pain in primary care improve over time in terms of coping rather than worsen.

To further investigate these findings, chi-square tests for independence were performed between pairs of coping variables and cross tabulations were examined to identify any important patterns of change over time across the coping variables (see Appendix 4, pg. 418 for full results). Figure 8.1 shows the co-occurrence of changes in depression and anxiety.

Figure 8.1: Changes in depression and anxiety from baseline to 12 months amongst patients with:

a) worsening anxiety



b) improved depression

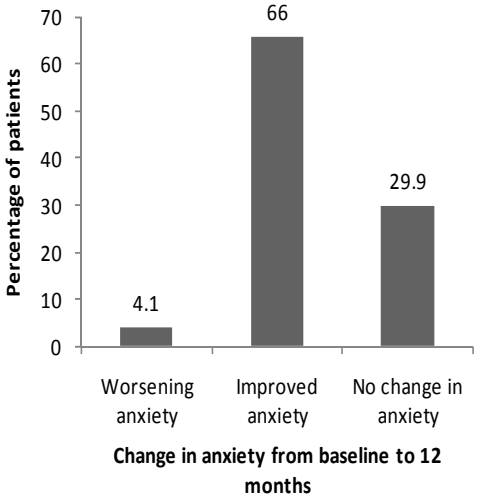


Figure 8.1 shows that changes in anxiety and depression appeared to occur together in the same direction. For example, for those patients whose anxiety got worse over time, 39.6% also showed worsening depression compared to 12.5% showing improved depression. Similarly, for those patients whose depression improved over time, 66% also showed improved anxiety compared to 4.1% showing worsening anxiety. There were also substantial proportions of patients whose depression did not change with worsening anxiety (47.9%) and whose anxiety did not change with improved depression (29.9%), however this reflects the nature of the data in that large groups of patients showed no change (of 0.5 SD or greater) in coping over time. It was found that improvements in anxiety and depression were also associated with improved catastrophizing (50.7% and 58.5%, respectively) and self-efficacy (40.1% and 52.3%, respectively). Worsening of depression was also associated with the worsening of passive coping (54%).

Changes in catastrophizing over time followed a similar pattern in that improvement and worsening tended to co-occur with changes in the same direction in other coping variables. Where catastrophizing improved over time, 48.9% of patients showed improvements in anxiety, 44.3% showed improved depression, 40.1% showed improved passive coping, and 45.3% showed improved self-efficacy. Where catastrophizing got worse over time, 21.4% of patients showed worsening anxiety, 33.9% showed worsening depression, 54.4% showed worsening passive coping, and 37.5% showed worsening self-efficacy. Improvements in self-efficacy were associated with a substantial number of patients showing improvements in anxiety (53.4%), depression (55.3%), catastrophizing (61.8%), and passive coping (42.7%). In addition, improvements in passive coping were associated with relatively large numbers of patients showing improved anxiety (43.9%), depression (39.8%), catastrophizing (50%), and self-efficacy (38.9%). Overall, these observations suggest that the key coping factors tend to change in the same direction over time for individual patients (i.e. worsening in one form of coping is accompanied by worsening in others). Therefore after primary care consultation, individual patients appear to proceed on a pathway of coping that leads generally in the same direction (improvement, worsening, or maintenance over time). The challenge for researchers and clinicians in the field is to work out how to predict which pathway a patient will take in order to be better able to identify and target treatments at those individuals who are at increased risk of poorer coping and subsequent poor pain and disability outcomes.

It is important to note that previously, this thesis has reported anxiety as a positive coping factor (see Chapter 7). The preliminary observations made here appear to contradict this, suggesting that anxiety is actually a negative coping factor due to the direction of the reported associations. This would also be in-line with previous research, which has shown that anxiety is generally predictive of increased disability scores (Jensen et al, 2010). Chapter 7 did highlight the possibility of the result being an anomaly in the data, thus the preliminary observations made here will be taken as evidence of this suggested anomaly, and the remainder of this thesis will consider anxiety as a negative coping factor.

8.1.3. Other factors affecting change

In addition to the five coping variables examined here, Chapter 7 identified employment status and pain duration as important predictors of low back pain outcome 12 months after consultation. Therefore these variables were labelled as potential confounders of the relationship between coping and outcome and were subsequently controlled for. As potential confounders, it is important to examine any effects that these variables might have on whether coping changes over time and how.

Changes in coping were examined separately in patients who reported that they were employed or unemployed at baseline. Table 8.2 shows the numbers and percentages of patients within each employment group dichotomised on whether coping improved or got worse over time.

Table 8.2: Changes in coping amongst employed and unemployed patients

	Worsening		Improvement	
	Employed	**Unemployed**	**Employed**	**Unemployed**
Anxiety	34 (9.6%)	13 (13.5%)	148 (41.9%)	30 (31.3%)
Depression	36 (10.2%)	14 (14.7%)	120 (34%)	23 (24.2%)
Catastrophizing	37 (13.9%)	17 (20.7%)	114 (42.9%)	26 (31.7%)
Self-efficacy	30 (11.2%)	15 (19%)	84 (31.5%)	18 (22.8%)
Passive behavioural coping	109 (30.6%)	36 (37.5%)	143 (40.2%)	28 (29.2%)

Table 8.2 reveals a clear trend, suggesting that employment status at baseline is related to how coping changes over time. The percentage of patients whose coping improved over time was consistently higher for those who reported being employed at baseline than those who reported being unemployed. Also, a consistently lower percentage of employed patients was found to show a worsening of coping over time. Overall, table 8.2 reveals that baseline employment status is related to how coping changes over time, with more positive and less negative changes shown by employed compared to unemployed patients. It is important to note however, that the numbers of patients in some of the coping change groups here were small, therefore these data must be interpreted with caution.

Changes in coping were also examined across the five pain duration groups, looking at the numbers (and percentages) of patients within each pain duration group whose coping improved or got worse over time (see Appendix 4, pg. 438). When looking at improvements in coping over time, baseline pain duration appears to impact on this change in one of two ways. Firstly, with regard to an improvement in anxiety and depression, the percentage of patients showing an improvement in coping from baseline to 12-months follow-up falls after the 3 month point (i.e. at 4 months and beyond), and the percentage of patients showing an improvement in

catastrophizing and self-efficacy from baseline to 12 months follow-up falls after the 6 month duration point (i.e. at 7 months and beyond) (for example, see figure 8.2).

Figure 8.2: Change in depression across pain duration groups

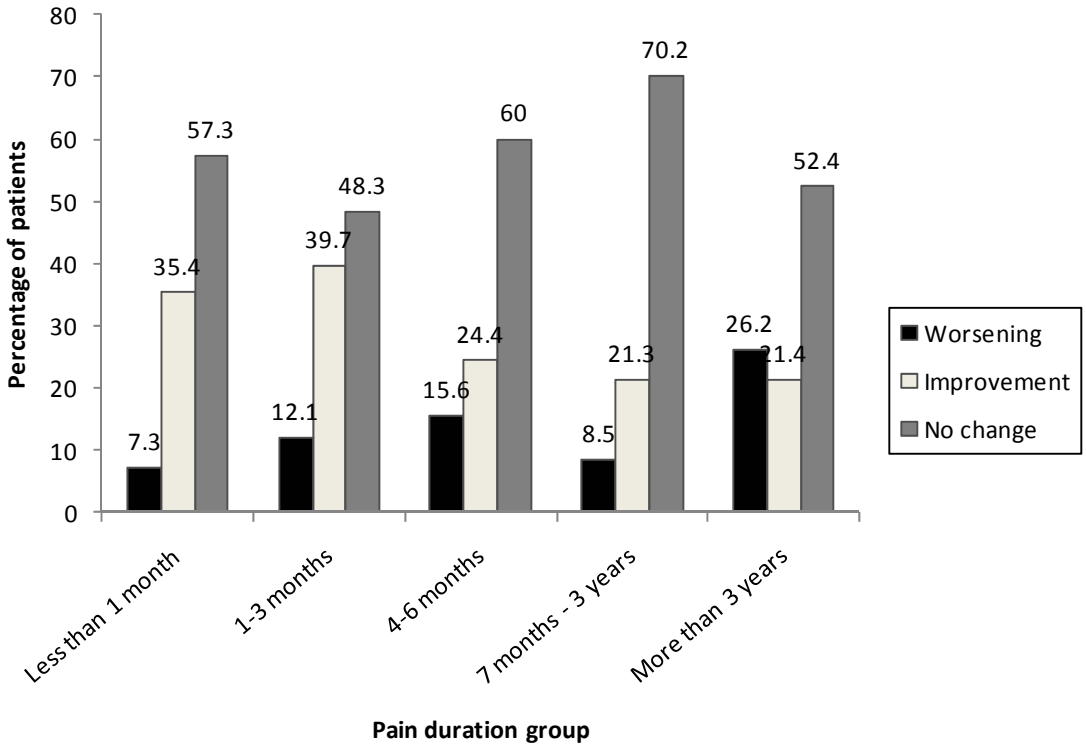


Figure 8.2 shows that as back pain episode duration increases and patients have more chronic pain, there are fewer patients whose depression improves over time. It also shows that with regard to depression levels, a large proportion of patients did not change over time. However, this again reflects the nature of the data in that large groups of patients showed no change in their coping over time. For anxiety and depression, improvements in coping begin to fall steadily after the 3 month point (i.e.

at 4 months and beyond). For catastrophizing and self-efficacy, a large fall in coping improvement occurs after the 6 month point (i.e. at 7 months and beyond). So those patients who entered the study at baseline whose pain had lasted longer than 3 or 6 months, displayed less improvement in coping than those patients who entered the study with shorter pain durations. Secondly, with regard to an improvement in passive coping, the percentage of patients reporting improvements from baseline to 12-months follow-up shows a linear relationship; as baseline pain duration increases, improvements in coping over time decrease. These findings suggest that there may be different patterns of coping change for patients with differing pain durations, and it would appear that those patients in the early stages with more acute pain problems are the ones whose coping improves the most.

To examine this further, numbers of patients in the 'no change' groups were compared across the five pain duration groups (see table 8.3). Table 8.3 reveals quite consistently that coping changed more in those patients with shorter pain duration at baseline, whereas patients who had experienced pain for longer than 6 months at baseline appeared to change their coping behaviour less. For example, self-efficacy did not change for 33 (78.6%) patients who had experienced pain for between 7 months and 3 years, whereas a substantially lower proportion (53.4%, n = 70) of patients who had experienced pain for less than 1 month reported no change in self-efficacy.

Table 8.3: Numbers (%) of patients across the pain duration groups whose coping did not change over time

	No change				
	Less than 1 month	**1 – 3 months**	**4 – 6 months**	**7 months – 3 years**	**More than 3 years**
Anxiety	89 (46.4%)	51 (44%)	21 (46.7%)	30 (62.5%)	26 (61.9%)
Depression	110 (57.3%)	56 (48.3%)	27 (60%)	33 (70.2%)	22 (52.4%)
Catastrophizing	59 (45.4%)	39 (42.4%)	12 (30%)	18 (40%)	22 (57.9%)
Self-efficacy	70 (53.4%)	47 (51.1%)	23 (59%)	33 (78.6%)	21 (55.3%)
Passive behavioural coping	45 (23.3%)	44 (37.6%)	13 (28.9%)	13 (26.5%)	15 (35.7%)

8.2. Is there a relationship between change in coping over time and low back pain outcome?

In order to examine whether change in coping over time affects low back pain outcome (pain intensity and disability at 12 months follow-up), one way ANOVA calculations were performed for each coping variable to determine whether there were any significant differences in mean outcome scores across the change groups. Tables 8.4 and 8.5 show the mean (SD) outcome scores for each coping variable across the change groups, for pain intensity and disability, respectively.

Table 8.4: Mean (SD) 12-month pain intensity scores* across the coping change groups

	Coping worsening	**Coping improvement**	**Coping no change**
Anxiety	3.88 (2.86)	2.22 (2.40)	2.62 (2.57)
Depression	4.00 (2.74)	2.10 (2.27)	2.60 (2.61)
Catastrophizing	4.43 (2.57)	2.78 (2.42)	3.00 (2.55)
Self-efficacy	4.08 (2.95)	2.31 (2.20)	3.32 (2.50)
Passive behavioural coping	3.48 (2.57)	1.65 (2.16)	2.83 (2.68)

*Mean score of patient ratings of least, usual, and current pain levels. Scores ranged from 0 to 10, with higher scores indicating greater pain intensity

Table 8.5: Mean (SD) 12-month disability scores* across the coping change groups

	Coping worsening	Coping improvement	Coping no change
Anxiety	9.35 (8.16)	4.71 (5.40)	5.95 (5.85)
Depression	9.82 (6.80)	4.29 (4.99)	5.88 (6.19)
Catastrophizing	10.74 (6.19)	5.92 (5.31)	6.61 (6.32)
Self-efficacy	10.00 (6.90)	4.98 (4.96)	7.21 (6.12)
Passive behavioural coping	8.03 (6.33)	3.70 (5.22)	6.09 (6.00)

*Score of the Roland-Morris Disability Questionnaire (RMDQ). Scores ranged from 0 to 24, with higher scores indicating greater disability

Tables 8.4 and 8.5 reveal consistently higher pain and disability scores amongst patients whose coping got worse over time. The results of the one way ANOVA calculations were subsequently examined to determine if the mean differences were statistically significant (see Appendix 4, pg. 439 for full results).

Anxiety

There was a statistically significant difference in 12-month pain intensity scores for the three change groups ($F [2, 447] = 8.1$, $p<0.001$). Post-hoc comparisons using the Tukey HSD test indicated that the mean score for the worsening anxiety group was significantly different from the mean scores for the improvement and no change groups. There was also a statistically significant difference in 12-month disability scores for the three change groups ($F [2, 453] = 11.7$, $p<0.001$). A post-hoc Tukey test revealed that, as with pain intensity, it was the mean score for the worsening group that was significantly different from the mean scores for the other two change groups. Examination of the mean scores revealed that those patients whose anxiety got worse from baseline to 12 months follow-up had significantly higher levels of pain

intensity and disability than those patients whose anxiety improved or remained the same.

Depression

A statistically significant difference was found between the three change groups for 12-month pain intensity ($F [2, 447] = 10.5$, $p<0.001$) and 12-month disability ($F [2, 452] = 16.4$, $p<0.001$). Post-hoc Tukey tests and examination of the mean pain intensity scores for the change groups revealed that the mean score for the worsening group was significantly higher than the mean scores for the improvement and no change groups. When disability was investigated with post-hoc tests, it was found that there were significant differences between all three change groups. Patients whose depression got worse over time were found to have the highest 12-month disability scores, whereas patients whose depression improved over time were found to have the lowest disability scores.

Catastrophizing

Statistically significant differences were also found between the three catastrophizing change groups for 12-month pain intensity ($F [2, 347] = 9.2$, $p<0.001$) and 12-month disability ($F [2, 351] = 14.1$, $p<0.001$). Post-hoc Tukey tests and examination of the mean scores for the change groups revealed that for both 12-month pain intensity and 12-month disability, the worsening group had significantly higher scores than the

improvement and no change groups, following an almost identical pattern to the findings for the anxiety and depression change groups.

Self-efficacy

The mean 12-month pain intensity and disability scores were also significantly different between the three self-efficacy change groups: ($F [2, 346] = 9.6$, $p<0.001$) and ($F [2, 349] = 12.1$, $p<0.001$), respectively. Post-hoc Tukey tests and examination of the mean 12-month pain intensity scores revealed that the mean score for the improvement group was significantly lower than the mean scores for the worsening and no change groups. When disability was investigated with post-hoc tests, it was found that there were significant differences between all three change groups. Patients whose self-efficacy got worse over time were found to have the highest 12-month disability scores, whereas patients whose self-efficacy improved over time were found to have the lowest scores.

Passive coping

A statistically significant difference was found between the three passive coping change groups for 12-month pain intensity ($F [2, 449] = 22.7$, $p<0.001$) and 12-month disability ($F [2, 456] = 22.3$, $p<0.001$). Post-hoc Tukey tests and examination of the mean 12-month pain intensity scores for the change groups revealed that the mean score for the improvement group was significantly lower than the mean scores for the

worsening and no change groups. When 12-month disability was investigated with post-hoc tests, it was found that there were significant differences between all three change groups. Patients whose passive coping improved over time were found to have the lowest 12-month disability scores, whereas patients whose passive coping got worse over time were found to have the highest scores.

The results of these analyses are all in the expected direction (i.e. patients whose coping worsened over time reported higher levels of pain intensity and disability at 12 months follow-up, whereas patients whose coping improved over time reported lower levels). However, a closer look at these results reveals something more clinically meaningful in terms of patient assessment and intervention. Although a linear association was found in all cases, in most of these cases it was the worsening of coping over time that was significantly related to back pain outcome, with the differences between coping improvement and no change emerging as not statistically significant. The only exception to this trend was the finding that for self-efficacy and passive coping, an improvement was associated with significantly lower pain intensity, whereas the level of pain intensity for those patients who showed a worsening of self-efficacy or passive coping over time was not significantly different from the level of pain intensity for patients in the ‘no change’ groups.

The following section will examine whether coping worsening or improvement over time is predictive of outcome in an attempt to address the first aim of this chapter and to provide support for the assumption that it is in fact the worsening of coping over time that seems to be most important.

8.3. Does change in coping over time predict low back pain outcome?

Hierarchical multiple regression analysis was used to identify whether the worsening of coping over time is predictive of 12-month pain intensity and disability after controlling for potential confounding variables (employment status and pain duration). The number of patients whose coping got worse over time ranged from 47 to 148 across the five coping variables. The confounding variables were entered into the first block within the model, therefore ensuring that these variables were statistically controlled for. Worsening codes for each of the five coping variables were then entered into the second block to determine whether they were still able to explain some of the remaining variance in pain intensity scores after the removal of the possible effect of the confounders. Table 8.6 summarises the key results of the hierarchical multiple regression analysis model.

Table 8.6: Summary of the hierarchical multiple regression analysis model

Model	R Square	R Square Change	Sig. F Change	F	Sig.
1	0.227	0.227	0.000	49.791	0.000
2	0.295	0.068	0.000	19.999	0.000

Table 8.6 shows that the model as a whole explains 30% of the variance in pain intensity scores at 12-months follow-up and is therefore a significant model ($F [7, 334] = 20.00$, $p<0.001$). It also shows an R Square Change value of 0.068, revealing that after controlling for the confounding variables, coping worsening over time explains an additional 6.8% of the variance in 12-month pain intensity. This is a relatively low

percentage, but it is nevertheless a statistically significant contribution, as indicated by the Sig. F Change value (p>0.001). Table 8.7 shows the Beta values for each of the coping variables within the model.

Table 8.7: Relationships between coping worsening over time and pain intensity at 12-months, adjusted for confounding variables

Worsening of coping variables	Beta	Sig.
Anxiety (n = 48)	0.112	0.021*
Depression (n = 50)	0.037	0.474
Catastrophizing (n = 57)	0.124	0.013*
Self-efficacy (n = 47)	0.033	0.512
Passive behavioural coping (n = 148)	0.137	0.004**

*Beta = significant (p<0.05)
** Beta = significant (p<0.01)

Table 8.7 shows that only the worsening of anxiety, catastrophizing, and passive coping over time emerged as independently predictive of 12-month pain intensity when all the other coping variables and confounders were included in the model. Of these variables, the most predictive was the worsening of passive coping over time, with a Beta value of 0.137 (p<0.01). This was followed by the worsening of catastrophizing (Beta = 0.124, p<0.05), and then anxiety (Beta = 0.112, p<0.05).

An identical hierarchical multiple regression analysis was performed to identify whether the worsening of coping over time is predictive of 12-month disability. Table 8.8 summarises the results. Table 8.8 shows that the model as a whole explains 36% of the variance in disability scores at 12-months follow-up and is therefore a significant model (F [7, 334] = 26.40, p<0.001). It also shows an R Square Change value of 0.097, revealing that after controlling for the confounding variables, coping

worsening over time explains an additional 9.7% of the variance in 12-month disability. This is a statistically significant contribution, as indicated by the Sig. F Change value ($p<0.001$). Table 8.9 shows the Beta values for each of the coping variables within the model.

Table 8.8: Summary of the hierarchical multiple regression analysis model

Model	R Square	R Square Change	Sig. F Change	F	Sig.
1	0.259	0.259	0.000	59.384	0.000
2	0.356	0.097	0.000	26.403	0.000

Table 8.9: Relationships between coping worsening over time and disability at 12-months, adjusted for confounding variables

Worsening of coping variables	Beta	Sig.
Anxiety (n = 48)	0.128	0.006**
Depression (n = 50)	0.054	0.271
Catastrophizing (n = 57)	0.151	0.002**
Self-efficacy (n = 47)	0.066	0.165
Passive behavioural coping (n = 148)	0.137	0.003**

*Beta = significant ($p<0.05$)
** Beta = significant ($p<0.01$)

Table 8.9 shows that as with pain intensity, the worsening of anxiety, catastrophizing, and passive coping over time emerged as independently predictive of 12-month disability when all other coping variables and confounders were included in the model. The Beta values for all three variables were significant at the $p<0.01$ level, with catastrophizing emerging as the most predictive (Beta = 0.151), followed by passive coping (Beta = 0.137), and anxiety (Beta = 0.128). These findings support the

assumption that deterioration in coping over time is important in the prediction of low back pain outcome at 12 months.

However, it was also assumed that coping improvement over time is not predictive of low back pain outcome, with the possible exception of improvement in passive coping. Further investigation of this was conducted using the same hierarchical multiple regression analysis model as for coping worsening (see Appendix 4, pg. 449 for full results). It was found that for both pain intensity and disability, the model did reach statistical significance ($F [7,334] = 18.18$, $p<0.001$; $F [7, 334] = 20.95$, $p<0.001$, respectively), predicting 28% of the variance in pain intensity scores and 31% of the variance in disability scores. However, coping improvement only explained an additional 4.9% of the variance in pain intensity scores and 4.6% of the variance in disability scores after controlling for the confounding variables. In-line with previous assumptions, improvement in passive coping (i.e. a reduction in passive coping) was the only coping variable that emerged as independently predictive of disability. For pain intensity, improvement in both passive coping and self-efficacy emerged as independent predictors, however the Beta value for self-efficacy was low and only just reached statistical significance at the $p<0.05$ level. It would therefore be reasonable to infer that these results support the assumption that with the exception of passive coping (where both improvement and worsening appear influential), it is in fact the worsening of coping over time that is important in the prediction of low back pain outcome.

This section addressed the first aim of this chapter, revealing that change in coping over time (coping worsening in particular) predicts future low back pain outcome. The

following section will provide a further investigation of baseline pain duration, which has been highlighted as important throughout the analyses conducted within this thesis. This will address the second aim of this chapter by determining whether baseline pain duration interacts in some way with patient coping over time to predict low back pain outcome.

8.4. A closer look at pain duration

This chapter has already shown that pain duration impacts on change in coping over time, suggesting that there may be different patterns of change for patients with differing pain durations (see section 8.1.3.). It is therefore possible that pain duration predicts how coping changes over time. To investigate this further, separate linear regression analyses were performed for each coping variable to determine whether baseline pain duration was significantly predictive of coping worsening over time (see section 8.3 for a justification of the use of coping worsening versus coping improvement over time). Table 8.10 shows the Beta values that were calculated for each of the coping variables.

Table 8.10: Relationships between pain duration and coping worsening over time

Worsening of coping variables	Beta	Sig.
Anxiety (n = 48)	0.043	0.370
Depression (n = 50)	0.137	0.004**
Catastrophizing (n = 57)	0.074	0.172
Self-efficacy (n = 47)	0.077	0.157
Passive behavioural coping (n = 148)	0.173	0.000**

** Beta = significant (p<0.01)

Table 8.10 shows that baseline pain duration was significantly predictive of the worsening of both depression and passive coping across the 12 months following consultation ($p<0.01$). Therefore it is possible that these variables interact in some way to predict low back pain outcome. To investigate this further, a series of regression analyses were performed to determine whether change in coping over time might be mediating the relationship between pain duration and outcome. Baron and Kenny (1986) stated that there are three steps that must be performed to establish a mediator. Firstly, the predictor variable must be shown to predict the outcome variable. Secondly, the predictor variable must be shown to predict the mediator. Thirdly, the mediator must be shown to predict the outcome variable when the effects of the predictor variable are controlled for. These steps were followed for both pain intensity and disability, using both depression and passive coping worsening as potential mediators:

Step 1

Does the predictor variable (pain duration at baseline) predict the outcome variables (pain intensity and disability at 12 months)?

Chapter 7 showed that baseline pain duration does in fact predict pain intensity and disability at 12 months (Beta = 0.419, $p<0.001$; Beta = 0.431, $p<0.001$, respectively).

Step 2

Does the predictor variable (pain duration at baseline) predict the mediators (depression and passive coping worsening over time)?

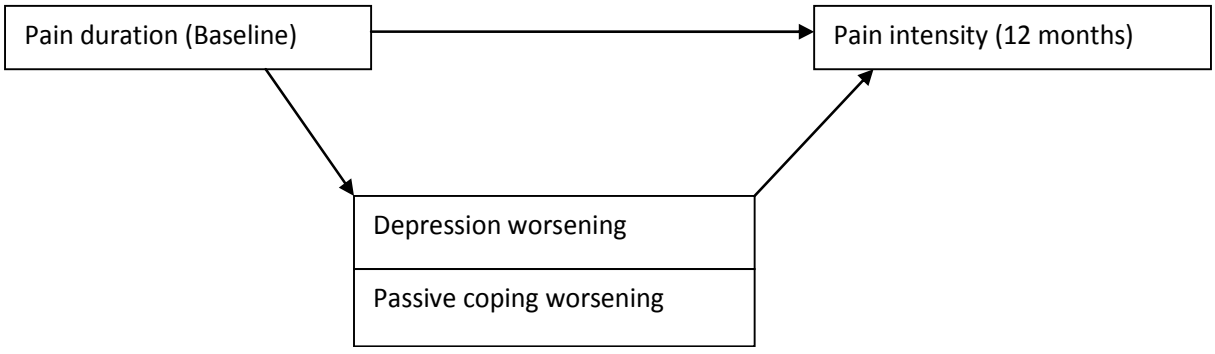
Table 8.10 shows that pain duration does predict the worsening of both depression and passive coping over time (Beta = 0.137, p<0.01; Beta = 0.173, p<0.01, respectively).

Step 3

Do the mediator variables (depression and passive coping worsening) predict the outcome variables (pain intensity and disability at 12 months) when the effects of the predictor variable (pain duration at baseline) are controlled for?

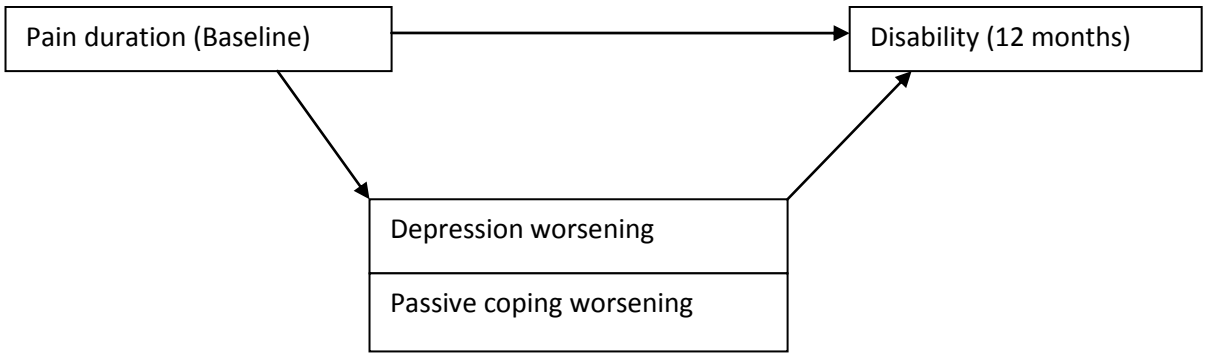
For this third step, separate linear regression analyses were performed for each of the mediator variables with each of the outcome variables (see Appendix 4, pg. 451 for full results). These found that both depression and passive coping worsening were predictive of pain intensity (Beta = 0.137, p<0.01; Beta = 0.171, p<0.01, respectively), and that the effects of pain duration on outcome were reduced but not eliminated, indicating that depression and passive coping worsening are partial mediators of the relationship between baseline pain duration and pain intensity at 12 months (see figure 8.3).

Figure 8.3: The relationship between baseline pain duration, change in coping over time, and 12-month pain intensity



For disability, it was again found that both depression and passive coping worsening were predictive of outcome at 12 months follow-up (Beta = 0.176, $p<0.01$; Beta = 0.182, $p<0.01$, respectively). An examination of the Beta values for pain duration showed that these values were reduced, however pain duration was still a significant predictor of disability. This indicates that depression and passive coping worsening are also partial mediators of the relationship between baseline pain duration and disability at 12 months (see figure 8.4).

Figure 8.4: The relationship between baseline pain duration, change in coping over time, and 12-month disability



As it has now been established that the relationship between baseline pain duration and low back pain outcome is mediated by the worsening of depression and passive coping over time, it would be interesting to investigate whether actual levels of coping at baseline might influence this relationship through associations between variables. In order to investigate this, the three steps to establishing a mediator (Baron and Kenny, 1986) were used again:

Step 1

Does the predictor variable (pain duration at baseline) predict the outcome variables (pain intensity and disability at 12 months)?

This step is the same as in the previous analysis (looking at change in coping over time) in that Chapter 7 showed pain duration to be predictive of outcome at 12 months follow-up.

Step 2

Is the predictor variable (pain duration at baseline) associated with the five baseline coping variables (those shown to be predictive of outcome in Chapter 7)?

Separate linear regression analyses were performed for each of the coping variables. Table 8.11 shows the Beta values that were calculated for each variable.

Table 8.11: Relationships between pain duration and the baseline coping variables

Coping variables (BL)	Beta	Sig.
Anxiety	0.173	0.000**
Depression	0.195	0.000**
Catastrophizing	0.233	0.000**
Self-efficacy	-0.207	0.000**
Passive behavioural coping	0.005	0.830

** Beta = significant (p<0.01)

Table 8.11 shows that pain duration is associated with baseline levels of coping across all of the variables (p<0.01) except passive coping. Baseline passive coping is therefore not involved in the relationship between pain duration and outcome. Therefore passive coping was not included in the subsequent analysis (see step 3).

Step 3

Do baseline levels of anxiety, depression, catastrophizing, and self-efficacy predict the outcome variables (pain intensity and disability) when the effects of pain duration are controlled for?

Separate linear regression analyses were performed for each of the coping variables with each of the outcome variables. Table 8.12 shows the Beta values that were calculated for each variable.

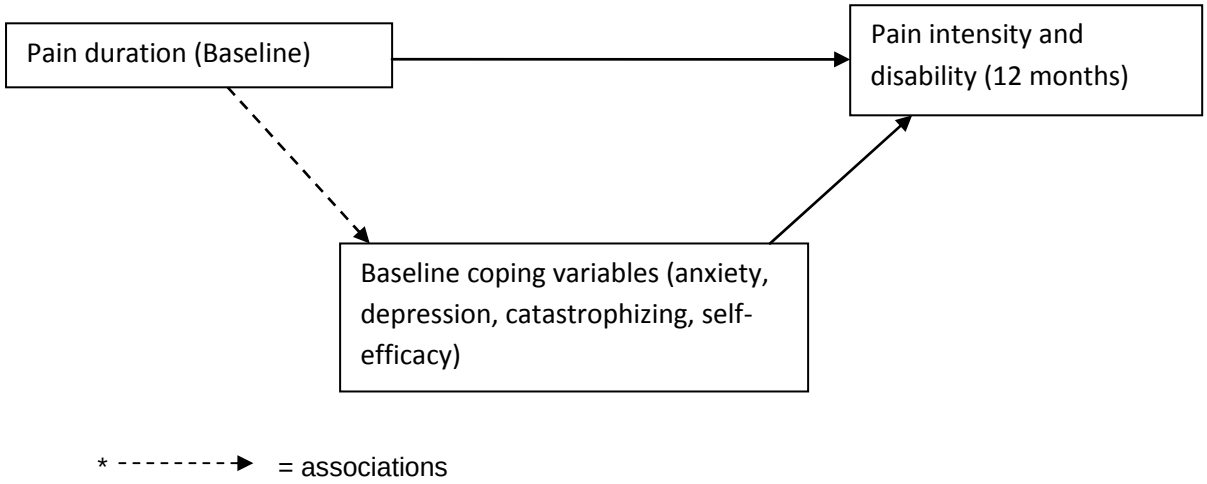
Table 8.12: Relationships between the baseline coping variables and outcome, whilst controlling for pain duration

	Coping variables (BL)	Beta	Sig.
Pain intensity (12M)	Anxiety	0.249	0.000**
	Depression	0.354	0.000**
	Catastrophizing	0.371	0.000**
	Self-efficacy	-0.359	0.000**
Disability (12M)	Anxiety	0.263	0.000**
	Depression	0.417	0.000**
	Catastrophizing	0.371	0.000**
	Self-efficacy	-0.455	0.000**

** Beta = significant ($p<0.01$)

All four of the baseline coping variables were predictive of 12 month pain intensity and disability ($p<0.01$). In each case, the effects of pain duration on outcome were reduced but not eliminated, revealing that some of the predictive value of baseline pain duration might be a result of its association with the baseline coping variables (see figure 8.5).

Figure 8.5: The relationship between baseline pain duration, baseline coping variables, and outcome at 12 months follow-up*



In addition to pain duration, Chapter 7 identified employment status as an important predictor of low back pain outcome. Therefore, additional analyses (following the three steps to establishing a mediator) were performed to examine the specific role of employment status (see Appendix 4, pg. 455 for full results). It was found that employment status was associated with baseline levels of coping, but was not predictive of coping worsening over time ($p>0.05$). Subsequently, it was found that all five of the baseline coping variables were predictive of both pain intensity and disability at 12 months follow-up when the effects of employment status were controlled for ($p<0.01$) and in each case, employment status continued to also have a direct effect on outcome. These findings are similar to those for pain duration, revealing that the effects of employment status at baseline on pain intensity and disability at 12 months follow-up might be influenced by patient coping.

8.5. Discussion

This chapter aimed to examine whether change in coping over time is predictive of future low back pain outcome and whether baseline pain duration impacts on this relationship. To address this aim, this chapter began with an investigation of when and how coping changes over time, examining how an important change in coping can be identified and the numbers of patients who reported change over time to this degree. This change in coping was then investigated further, examining emerging patterns and associations with other factors. This chapter then examined the relationships between change in coping over time and low back pain outcomes, and whether change in coping is predictive of outcomes at 12 months follow-up. This was followed by a closer look at pain duration and its interaction with the other predictor variables.

8.5.1. Whose coping changed and how?

It was found that for four out of the five coping variables examined, the highest percentages of patients belonged to the ‘no change’ groups, with the fifth variable also showing a relatively high percentage of patients with no change over the 12 month follow-up period. One possible explanation for this finding is that the BeBack sample of patients was recruited through primary care and therefore most will have received care from their GP consisting of advice and analgesia. Most will not have received clear or focused interventions to help them improve their coping and it is

therefore unsurprising that for many, coping did not change over time. Previous research also indicates that coping strategies are moderately to highly stable over time across a range of pain conditions, such as cerebral palsy and sickle cell disease (Gil et al, 1997; Jensen et al, 2006). For example, Jensen et al (2006) reported that between 15% and 64% of the variance in coping at six months follow-up could be accounted for by baseline coping scores.

For those patients whose coping did change from baseline to 12 months follow-up, it was clear that much larger percentages of patients showed coping improvement over time, rather than coping worsening. This is in-line with previous findings, showing that many primary care patients with initial episodes of acute pain improve rapidly in terms of outcome variables (Carey et al, 1995; Pengel et al, 2003), even when complete recovery is slow (Henschke et al, 2008). It would follow that improvements would also be seen in coping during this time. In addition, people are more likely to consult their GP when they are having difficulty coping with their pain, therefore the baseline levels of poor coping reported here represent a peak for many patients within this sample. It is therefore unsurprising that coping was more likely to improve over time for these patients.

Results of chi-square tests for independence showed substantial co-occurrence between changes in anxiety and depression (i.e. improvement in depression occurring with improvement in anxiety). This could be explained by the high correlations between the two HADS subscales reported here (see Chapter 6) and in previous research (Moorey et al, 1991; Spinhoven et al, 1997), however there were also co-occurrences between changes in anxiety/depression and other coping

variables, suggesting that changes tend to occur together in the same direction (e.g. towards improvement).

As it would be beneficial to be able to predict to some extent the patients whose coping will improve or get worse over time, subsequent analyses were performed to establish whether the potential confounders identified within this thesis (employment status and pain duration) showed any associations with how coping changed over time. Employment status appeared to be associated with change in coping over time, with consistently more positive changes amongst those patients who were employed at baseline. There are several possible explanations for this. Firstly, it is possible that unemployed patients simply have more serious pain problems, resulting in them having to leave work and being less able to cope positively over time. Secondly, it could be that employed patients are generally more active than unemployed patients as a result of their employment status (Jahoda, 1982). It is also possible that employment actually encourages more positive and less negative coping over time through factors such as attitudes and beliefs or distraction from the back pain. For example, a patient may think that their back pain problem is not serious because they have managed to maintain their job, whereas if a patient has had to leave their job due to their pain problem (likely to apply to at least some of the unemployed patients in this sample), they are likely to think that it is more serious. This could lead to increased negative mood and poorer coping over time, whereas maintenance of employment might help to enhance self-efficacy and improve coping over time.

Pain duration also appeared to be associated with how coping changed over time. The results revealed that patients with longer pain duration at baseline displayed less

improvement in coping than patients with more acute pain. This is unsurprising however, because patients with acute pain also change most in terms of improvements in pain and disability, and it seems logical that improved outcomes would be accompanied by improved coping efforts. Further investigation of the 'no change' groups for each coping variable revealed that the proportions of patients in these groups were consistently lower for patients with shorter pain durations (i.e. patients with more acute pain generally reported greater changes in coping over time than patients with more chronic pain). The patients in this primary care consultation cohort received no focused intervention targeting improved coping and thus it can be concluded that the acute pain patients were more able to change their coping without this type of intervention. This suggests that it might be more time and cost effective for interventions focused on coping improvements to be targeted at those patients who consult within primary care with more chronic pain problems, to better enable them to change the way they cope with their pain. However, as the examination of how coping changes over time with differing pain durations is a relatively new and novel area of investigation, there is little previous research to provide comparable findings and thus, more research is needed before any firm recommendations can be made.

8.5.2. The relationship between change in coping over time and low back pain outcome

One way ANOVA calculations revealed significant differences in mean outcome scores across the coping change groups, with greater pain and disability reported by

patients whose coping got worse over time. It was found that for most of the coping variables, it was the worsening of coping over time that was significantly related to low back pain outcomes, not the improvement of coping over time. It is interesting that in most cases, the levels of pain and disability reported by patients whose coping improved over time were not significantly different from those of patients whose coping stayed the same and therefore, it was coping worsening over time that emerged as important. Previous research with fibromyalgia patients has also found support for an association between change in coping (following multidisciplinary pain treatment) and outcomes (Nielson and Jensen, 2004), however the direction of this relationship and the role of change in coping over time as a predictor of low back pain outcome has yet to be fully explored.

Upon further investigation, hierarchical multiple regression analyses revealed that coping worsening over time explained 30% of the variance in 12-month pain intensity scores, and 36% of the variance in 12-month disability scores. After controlling for confounders, coping worsening over time explained an additional 6.8% of the variance in 12-month pain intensity, and an additional 9.7% of the variance in 12-month disability. Of the five coping variables, only anxiety, catastrophizing, and passive behavioural coping were independent predictors. Identical analyses were conducted for coping improvement over time and it was found that the additional percentages of the variance in the outcome variables that were explained by coping improvement over time were low, with only one coping variable emerging as a strong independent predictor (passive behavioural coping). These findings contradict those of Turner and Clancy (1986) who found that improved (i.e. decreased) catastrophizing

was significantly related to improved low back pain outcomes, however the changes they reported were in response to treatment programs as opposed to the changes over time that occurred without intervention amongst the BeBack patients. Findings from the hierarchical multiple regression analyses within this chapter do, however, also support the results of the one way ANOVAs in that it appeared to be the worsening of coping over time that was important in predicting low back pain outcomes. One possible explanation for this is that coping worsening occurs alongside the worsening of back pain problems and this becomes a vicious circle of spiralling severity (i.e. a small deterioration in coping can lead to worsening pain problems [or vice versa], which in turn can lead to greater deterioration in coping and increasingly worse low back pain outcomes). It could be argued that a small improvement in coping would not have as great an effect on low back pain outcomes (or vice versa) and therefore would not initiate an opposing spiral of improvement.

The findings here suggest that in most cases, healthcare practitioners might do better to identify more systematically those patients in primary care whose coping appears to be worsening over time and then focus their efforts on preventing coping worsening in these patients, rather than trying to improve coping universally. GPs could potentially identify problematic patients through the frequency of their consultations and apparent worsening of their pain problems in terms of patient accounts of pain intensity, functional limitations and impact on work and social life. These patients could then be monitored to identify declines in specific coping factors, which could be targeted with focused interventions. This might be more time and cost effective than a universal coping intervention and would enable healthcare

professionals to invest more time, effort, and resources into those patients who are at increased risk of poor outcomes. Interventions could involve discussions between patients and healthcare professionals to explore why the patient feels their coping has changed and to facilitate coping management strategies that might help the patient to restore or even improve on their original coping efforts.

8.5.3. Interactions between pain duration, coping and outcome

Linear regression analyses showed that baseline pain duration was significantly predictive of the worsening of depression and passive behavioural coping over time, and further analyses revealed that these coping variables were partial mediators of the relationship between baseline pain duration and low back pain outcomes. When these analyses were repeated for employment status (another important confounding variable), the results were not replicated – employment status was not predictive of coping worsening over time. Both employment status and pain duration are important independent predictors of low back pain outcomes (see Chapter 7), therefore it is interesting that they do not have comparable effects on coping worsening over time. This could be due to the fact that employment status (at baseline) is a static variable. It might impact on coping initially, but as it generally remains stable throughout the study, it is likely that its effects on coping throughout the study will also remain stable. In contrast, pain duration reflects the stage at which a patient consults for their pain problem on a continually changing trajectory of increasing chronicity. The dynamic

nature of pain duration across the course of the study might be responsible for its impact on the deterioration of coping over time.

It was found that depression and passive coping were only partial mediators of the relationship between pain duration and outcomes. Therefore, pain duration also had a direct effect on the outcome variables. This could potentially provide support for the notion that pain duration might just be reflecting the stage a patient is at in the natural history, or 'trajectory', of their pain problem (see Dunn et al, 2011 and Dunn et al, 2006), because the effect of pain duration on outcome could just be reflecting the natural course of the specific pain trajectory a patient is on. Thus it would be practically impossible to intervene here to improve patient outcomes. However, the mediational effects of depression and passive coping worsening present an avenue for healthcare professionals to explore, with the potential to impact on the effects of pain duration on outcome to some extent. The results here show that baseline pain duration predicts depression and passive coping worsening over time, which in turn predict pain intensity and disability at 12 months follow-up. Therefore if interventions could systematically identify those patients in primary care whose depression and passive coping appear to be worsening over time, and then target these patients with coping management strategies, it is possible that this could reduce or prevent the worsening of depression and passive coping over time and ultimately improve low back pain outcomes despite the pain duration reported by these patients at baseline. In order to do this, GPs could identify those patients who present in primary care with long pain durations and monitor their levels of depression and passive coping, either through the use of standardised measures or simply through the use of a few specific

questions to give a general overview of the change in these coping-related factors. This could be a time and cost effective method of identifying potential patients for targeted interventions.

It is important to note that the study of the potential interactions between pain duration, coping change over time and low back pain outcome is relatively novel, therefore it is difficult to identify previous research for comparison of the findings reported here. As a result, recommendations must be regarded as preliminary until further research can be conducted to support the findings of this thesis.

A further series of analyses were performed to investigate whether the relationships between pain duration and low back pain outcomes were influenced in any way by associations with actual levels of coping at baseline. It was found that baseline pain duration was associated with four out of the five baseline coping variables (anxiety, depression, catastrophizing, and self-efficacy), and that these coping variables were predictive of low back pain outcomes when the effects of pain duration were controlled for. This indicates that some of the predictive value of baseline pain duration could potentially be explained by its association with the baseline coping variables. Examining this finding again in terms of the notion of pain trajectories, it could be that the specific path or trajectory that a patient follows can determine not only the point at which they consult in primary care for their pain, but also the way in which they initially attempt to cope with this pain. These findings all highlight the importance of pain duration and support previous reports of its importance within the field of low back pain research (Bekkering et al, 2005; Langworthy and Breen, 2007; May et al, 2008). It has repeatedly emerged as an important factor throughout this

thesis, and the findings here offer more detail as to the specific role of pain duration in the prediction of low back pain outcomes 12 months later. It has been shown that the effects of pain duration on outcome might be influenced by coping at baseline, and are partially mediated by coping worsening over time, and it has also been shown that there is still a direct effect of pain duration on outcome. Therefore it is particularly important for healthcare professionals to assess pain duration at primary care consultation to enable more effective targeting of coping-related interventions. Patients who consult with longer pain durations tend to have poorer coping at baseline, greater worsening of coping over time and poorer outcomes at 12 months follow-up, therefore a simple and cost effective method for targeting interventions would be to ask a single question to determine the duration of a patient's pain problem at the time of primary care consultation. Chapter 6 of this thesis showed that once patients reached the three-year pain duration point, their coping changed quite noticeably, becoming considerably more maladaptive. This was also supported by Dunn and Croft (2006), who identified "important differences between people who recall more or less than three years' duration" (pg. 126). Therefore, this indicates that the three-year point could be a cut-off for the targeting of pain management interventions. However, it is possible that many patients in need of intervention would be missed if this cut-off were to be used, and that the early window of opportunity for successfully intervening to improve low back pain outcomes would be lost. One possible solution could be to automatically refer patients for targeted interventions who report pain duration of three years or more, and to further monitor patients with pain durations of between three months (the point at which pain is defined as

‘chronic’) and three years in order to identify any patients who display particularly poor coping or coping worsening over time.

Employment status was also associated with baseline coping (unemployed patients had poorer coping at baseline), thus providing another quick and easy way of targeting those patients at risk of poor coping and ultimately poor low back pain outcomes. Therefore if lengthy coping assessment is not an option, a potentially advantageous alternative method would be to determine patients’ employment status and pain duration and to subsequently target coping interventions at unemployed patients and those with longer pain durations.

8.5.4. Chapter summary

The aim of this chapter was to examine whether change in coping over time is predictive of future low back pain outcome and to determine whether baseline pain duration impacts on this relationship. The results presented here revealed that the worsening of anxiety, catastrophizing and passive behavioural coping over time independently predicted pain intensity and disability at 12 months follow-up. The results also revealed significant interactions between pain duration, the worsening of depression and passive behavioural coping over time and low back pain outcome. The following chapter (see Chapter 9) will provide a summary of the main findings of this thesis and will present a model incorporating these findings to depict the interrelationships between key variables. This model will then be used to provide recommendations for future research and clinical practice.

9. Thesis summary and discussion

9.1. Overview

As noted earlier in this thesis (see Chapter 1), chronic pain is a major problem within the community and is estimated to affect 46.5% of the general population (Elliott et al, 1999). Back pain in particular has also been associated with high economic costs and is actually one of the most costly conditions in the UK (Maniadakis and Gray, 2000). When low back pain becomes chronic (more than three months duration), it often becomes problematic, complex and difficult to treat effectively, leading to poor patient outcomes in the longer term. The level of disability displayed by patients often appears to be disproportionate to the level of pain experienced, and it is now widely accepted amongst both clinicians and researchers that chronic low back pain can only be adequately understood and managed within a biopsychosocial framework (Okifuji and Palmer, 2004; Waddell, 2004). Indeed it has been suggested that psychosocial factors might actually be more important than medical factors (Patel, 2007). Coping-related factors have been suggested to be particularly important, however there has been little consistency in attempts to provide an operational definition of pain coping or on an agreed selection of measurement instruments that should be utilised. Furthermore, with the exception of Foster et al (2010), a wide range of coping-related factors have not been explored in any one study. This thesis has identified the key knowledge gaps in the literature and provided some recommendations for clinical practice and future studies of coping-related factors.

To begin with, a new definition of coping was proposed (see Chapter 1) that aims to overcome the various problems associated with previous definitions. The new definition identified ‘coping’ as a latent variable inferred from measurable indicators that include coping strategies, mood and beliefs. In addition, coping strategies were conceptualised as ‘cognitive’ or ‘behavioural’ in nature. This conceptualisation allowed for the fact that patients use different types of strategies and it was therefore not assumed that patients would use either cognitive or behavioural coping alone. Historically, coping researchers have consistently neglected behavioural coping, but the conceptual framework adopted in this thesis assigns equal importance to both cognitive and behavioural coping. The overall aim of this thesis therefore was to examine a wider range of coping-related factors that might be measurable indicators of the latent variable ‘coping’, in order to explore the role of ‘coping’ in primary care low back pain patients.

9.2. Summary of main findings

In order to address the overall aim of the thesis, a step-wise process was adopted to investigate the role of coping. Five main aims were identified (see Chapter 1) and addressed within subsequent chapters (see Chapters 2 to 9).

9.2.1. First aim

The first aim was to identify important psychological factors shown to be predictive of low back pain outcome. A systematic review of the published literature was therefore undertaken. In chapter 2, the systematic search strategy was developed to identify empirical, longitudinal and prospective cohort studies focusing on coping with low back pain amongst patients aged 18 years and above. Only studies using pain and/or disability as outcome variables were included. The search strategy incorporated a large number of search terms relating to pain, coping, study designs and settings, to ensure that all relevant published studies were identified. A number of additional search methods were also utilised to maximise the comprehensiveness of the search (i.e. searching databases of local experts and manually searching author names from relevant cross-sectional studies).

Following this, a 17-item quality assessment checklist was developed specifically for the systematic review. The development of this checklist was made explicit, in order to address the concerns of Mallen et al (2006), who stated that there is currently no clear consensus about the method of quality assessment used in systematic reviews of observational studies. All aspects of the development of this quality assessment checklist were based on existing tools and methods, with adaptations and amalgamations undertaken in order to provide the most thesis-specific checklist possible. The extracted data were presented and accompanied by a narrative summary.

The results of the review showed that fear avoidance beliefs/kinesiophobia emerged as the most important factor, with evidence consistently showing fear avoidance beliefs/kinesiophobia to be a significant risk factor for poor outcome amongst both acute and chronic low back pain patients. This is consistent with the findings of Vlaeyen et al (1995), who proposed a fear avoidance model demonstrating the pathway from fear avoidance beliefs to disability. Ramond et al (2011), in a recent systematic review, found that fear avoidance beliefs were independently linked with poor outcome, therefore the thesis findings are thought to accurately reflect the current literature. Ramond et al (2011) also reported that depression and passive coping strategies were independently linked with poor outcome, however the systematic review within this thesis did not find consistent evidence for the prognostic role of these factors. In the time since the systematic search was performed (April 2008), it would appear that additional studies have been published that were identified by Ramond et al (2011) to confirm the identification of depression and passive coping strategies as risk factors for poor low back pain outcome.

Other psychological factors that were identified in Chapter 2 as potentially important risk factors (with more limited frequency of measurement than fear avoidance) were anxiety, negative affect, and self-efficacy, but these factors were not directly reported on by Ramond et al (2011). Ramond et al (2011) did report that psychological distress was linked to poor outcome, and it could be argued that this variable relates to anxiety and negative affect. However they did not report on the literature relating to self-efficacy at all, or on the literature relating to catastrophizing (found here to be inconsistently related to poor outcome). This could either be due to the limited

number of published studies assessing the role of self-efficacy and catastrophizing, or it could be due to Ramond and colleagues choosing to neglect these factors in favour of those which have generated more recent interest in the literature (e.g. fear avoidance beliefs). This is a problem with much of the research conducted in the area, and one which this thesis has attempted to address by conducting a comprehensive systematic review of all relevant psychological factors with some evidence.

The systematic review also investigated the prognostic role of behavioural coping strategies, however there were very few published studies available for comparison (only five out of 29 studies measured behavioural coping). A lack of clarity in how to define and assess behavioural coping may be responsible in part for this relative paucity of data.

In summary, the first aim of this thesis was achieved with the systematic review reported in Chapter 2. This identified important psychological factors that are predictive of low back pain outcome, as well as factors that are potentially important and require further research. It also found that included studies tended to focus on only a small number of predictive variables (average = 2.2), and thus the relative importance or distinctiveness of the predictive variables could not be determined. To overcome this limitation, the analytical chapters of this thesis focused on a large database (the BeBack study) with many different predictive variables to assess which of these were independently predictive of outcome, as well as the relative strength of prediction. This thesis therefore provides a much more comprehensive assessment of the role of coping in low back pain than the majority of published studies. It also

emerged from the systematic review that, as mentioned in Chapter 1, pain coping is poorly defined and as a consequence is not assessed in a consistent manner. This creates heterogeneity in the published studies, making comparison difficult. It is also potentially responsible for the consistent omission of behavioural coping within studies focusing on the prognostic role of coping variables, as researchers are unsure about what constitutes behavioural coping and how best to measure it. These limitations formed the basis for the second overall aim of this thesis.

9.2.2. Second aim

The second aim was to provide a detailed overview of the measurement of cognitive and behavioural coping strategies, and to develop a new measure of behavioural coping for use in later stages of this thesis. Chapter 4 attempted to address this aim through the use of factor analysis on some of the BeBack questionnaire items relating to behavioural coping in order to develop a new measurement instrument. The overall aim was addressed further in chapter 5, which provided an overview of the measurement of cognitive coping and attempted to confirm the factor structure of the Coping Strategies Questionnaire-24 (CSQ-24) in the BeBack cohort of patients.

Chapter 4 began by exploring the analytical technique known as ‘factor analysis’. This technique provides a method of looking for common variance to identify the underlying factors within a set of items, and thus it was thought to be the ideal method for creating a smaller number of behavioural coping subscales from the BeBack questionnaire items. The requirements for using factor analysis were documented

and met by the BeBack data (i.e. the sample size was sufficiently large, the use of binary data was justified, Bartlett's test of sphericity was significant and the KMO value was above the minimum required for a good factor analysis), therefore confirming that factor analysis was appropriate. Two-, three-, and four-factor solutions were explored, with a two-factor solution emerging as optimal and interpreted as representing 'active' and 'passive' behavioural coping. The internal consistency of these factors was then investigated and it was found that a three-item scale (exercises/stretches, walking, swimming) provided the optimum internal consistency for active behavioural coping, and a six-item scale (GP medication, heat/cold, lying down, bedrest, walking stick, creams/sprays) provided the optimum internal consistency for passive behavioural coping.

There are currently no available standardised tools that specifically measure behavioural coping in pain conditions, therefore it is impossible to compare the results of this analysis with previous findings. However it could be noted that the internal consistencies of the active and passive behavioural coping scales reported here (0.44 and 0.50, respectively), although not particularly high, were considerably higher than that of the behaviour subscale that was included within the original CSQ, which had an alpha value of 0.28 (Rosenstiel and Keefe, 1983).

Chapter 4 therefore makes a new contribution to the pain coping field through the demonstration of the distinction between active and passive behavioural coping and the development of the first internally consistent measurement instrument to specifically measure behavioural coping strategies in primary care low back pain

patients. This new measurement instrument was utilised throughout the analytical chapters later in this thesis.

Chapter 5 began by examining available standardised instruments for use in the measurement of cognitive coping. An initial examination of generic coping measures (Ways of Coping Checklist – Folkman and Lazarus, 1980, and Daily Coping Inventory – Stone and Neale, 1984) was reported, followed by an examination of pain-specific coping measures (Vanderbilt Pain Management Inventory – Brown and Nicassio, 1987, Chronic Pain Coping Inventory – Jensen et al, 1995, and Coping Strategies Questionnaire – Rosenstiel and Keefe, 1983). Generic coping measures were thought to be unsuitable for use within this thesis due to their limited use and lack of validity within pain populations (DeGood and Tait, 2001; Endler et al, 1993; Stone and Neale, 1984). Pain-specific measures were shown to have greater validity (as expected due to their development within pain populations), and evidence was presented recommending the use of the CSQ due to its superior psychometric properties and comprehensiveness as a measure of coping (Jensen et al, 1995; Snow-Turek et al, 1996). This could explain why the CSQ has become the most widely used measure of pain coping strategies and has "formed the backbone of research on coping and adjustment to pain" (DeGood and Tait, 2001, pg.327). The CSQ is accepted around the world as a measure of pain coping and has been successfully translated and cross-culturally adapted for use in non-English speaking countries (Irachabal et al, 2008; Verra et al, 2006), as well as being shown to be useful in ethnically diverse populations (Hastie et al, 2004). However, its rather lengthy structure prompted the development of a shorter revised version, the CSQ-24 (Harland and Georgieff, 2003),

suggested to be the most appropriate version for clinical use (Grimmer-Somers et al, 2009) and the version that was included within the BeBack questionnaire. The CSQ-24 was developed within a British chronic low back pain population, which reflects the BeBack population (low back pain patients across North Staffordshire and Central Cheshire, UK). However the sample used to develop the CSQ-24 was small (n = 214), and Harland and Georgieff (2003) advised that further confirmatory analysis of the measure in a similar population would be beneficial. Researchers in the field have not carried out such analyses, therefore it was unclear as to whether the CSQ-24 was suitable for use in the analysis of coping in this thesis. It was decided therefore to re-examine the factor structure of the CSQ-24 using confirmatory factor analysis (CFA) as suggested by Harland and Georgieff (2003), in order to determine the suitability of the measure for further use here. It was considered that the size of the BeBack sample (n = 1,591) would permit a robust re-examination of the measure's psychometric properties.

The statistical assumptions necessary for CFA were met, but the results of the CFA did not support the use of the CSQ-24 in its original form, and therefore further exploratory analyses were performed. A split-half sample was used and provided surprising and contradictory results. Exploratory factor analysis (EFA) was performed on the first half of the sample, revealing an almost identical factor structure to that of the original CSQ-24, however when CFA was used on the second half of the sample, it again showed that the EFA solution could not be confirmed. Therefore EFA was performed on the whole sample in order to further investigate the factor structure of the CSQ-24. This again replicated the original CSQ-24 structure almost exactly,

therefore questioning the utility of the CFA technique within this dataset. There appeared to be methodological limitations to using CFA here (i.e. the use of categorical rather than continuous data and the suggestion that CFA itself might be a poor statistical technique), however the results of the EFA seemed clear and it was felt that the CSQ-24 in its original form was appropriate for use within this thesis based on the EFA results.

There is currently very limited research examining the factor structure of the CSQ-24, and no new studies have been published on this topic during the development of this thesis. It is therefore difficult to compare the findings here with other studies to investigate why such contradictory findings emerged and to determine which method of factor analysis was providing accurate results. One study (Chan et al, 2007) did use CFA to investigate the factor structure of the CSQ-24 and found that the structure could not be confirmed. This finding is in-line with the findings of this thesis, however there were several limitations associated with the Chan et al (2007) study (see Chapter 5), including the fact that they did not perform an EFA and therefore it is unclear whether their CFA results would have corresponded with an EFA or whether they too would have identified methodological limitations in the use of CFA for this purpose.

Chapter 5 thus provided new information with respect to the factor structure of the CSQ-24 using both exploratory and confirmatory factor analyses and adds to the sparse literature on this topic. It also addresses the need for further research to explore the discrepancies between EFA and CFA that was highlighted by van Prooijen and van der Kloot (2001) with regard to the overly conservative nature of

CFA, resulting in relatively small and unimportant deviations from the model often leading to model rejection. It is hoped that the findings of this chapter might encourage future research in this area to examine the methodological problems associated with using CFA and specifically with using CFA to confirm the factor structure of the CSQ-24.

As a result of Chapter 5, it was concluded that the use of CFA was problematic at least within this context and that the results of the EFA showed that the original factor structure of the CSQ-24 was appropriate for use within this thesis and the BeBack cohort of primary care low back pain patients due to the consistent results reported in both the split half and the whole sample EFAs. Therefore, no adaptations to the measure were required and the previously reported CSQ-24 structure (Harland and Georgieff, 2003) was subsequently utilised throughout the thesis to measure cognitive coping strategies.

9.2.3. Third aim

The third aim was to describe epidemiological patterns of coping (cognitive and behavioural) among patients consulting with low back pain in primary care, and to investigate whether they differ according to other patient characteristics. Chapter 3 addressed this aim by providing a description of the baseline characteristics of the BeBack sample, including a description of coping strategy use across the sample. Chapter 6 also addressed this aim by exploring the relationships at baseline between demographic, clinical, and coping variables and examining correlations between the

coping variables in order to identify potentially important variables and confounders for inclusion in later prospective analyses.

Chapter 3 began by providing information on the demographic and clinical characteristics of the sample at baseline. Broadly, these characteristics were shown to be similar to other primary care cohorts of low back pain patients. Negative skewness and kurtosis values highlighted that there was a clustering of older participants in the sample and a higher percentage of female than male patients, however this is frequently reported across the literature and was therefore expected (Cassidy et al, 1998; Gureje et al, 2001; Thomas et al, 1999). There was high variability in socio-economic status (SES), suggesting that low back pain affects people across all levels of SES and therefore is a problem that is not restricted to just one SES group. Employment status was less variable, with almost three quarters of the sample reporting that they were employed, and pain intensity and disability scores across the sample were generally towards the lower end of the scales, with few patients reporting severe problems. These findings are also to be expected within a primary care sample, as patients consulting in primary care are unlikely to have had to leave their jobs due to low back pain (this might occur more often in secondary/tertiary care samples), and levels of pain intensity and disability were shown to correspond to other, similar samples (Brealey et al, 2003; Burton et al, 1999; Jordan et al, 2006; Kendrick et al, 2001; Von Korff et al, 1998).

Coping strategy use was generally at the expected level for a primary care low back pain cohort, and similarities were reported between the BeBack sample and other primary care cohorts on coping variables such as anxiety, depression, and fear

avoidance beliefs (Runkewitz et al, 2006; Swinkels-Meewisse et al, 2003). It is expected that most primary care patients will report towards the less severe end of a pain problems scale due to the nature of their consultation (e.g. not yet requiring referral to specialist care services), therefore it is also expected that the reporting of psychological factors will reflect this (e.g. most patients will not report severe or extreme levels of coping/distress etc.). The BeBack sample did appear to follow this expectation. For example, mean anxiety, depression, and catastrophizing scores were towards the lower end of the scales and although pain self-efficacy scores were variable across the sample, few patients reported low scores. It was impossible to compare the BeBack behavioural coping strategy scores with scores from other primary care cohorts because the measurement of behavioural coping here was novel (see section 9.2.2.). A wide range in the percentages of patients using the behavioural coping strategies (from 6.6% to 63.3%) however was found.

Chapter 3 provided a description of the baseline characteristics of the BeBack sample of primary care low back pain patients. As a result of this chapter, it was concluded that the thesis utilises a typical sample and therefore the results of analyses within the thesis and subsequent recommendations are likely to be able to be generalised with some confidence to other primary care low back pain patients.

Chapter 6 began by examining associations between coping strategies and socio-demographic variables at baseline. Although no associations were found between age and behavioural coping, it was found that older patients tended to adopt a higher level of adaptive cognitive coping strategies than younger patients. Differences between age groups have been reported previously (Molton et al, 2008), with older

patients seemingly coping more positively across a range of medical conditions (Burckhardt et al, 2001; Mosher et al, 2010). One explanation that was put forward for this in Chapter 6 was that older patients might perceive low back pain to be less serious/threatening than younger patients due to an increased expectation and experience of health problems including low back pain, associated with getting older, and that this acceptance could result in more positive coping. This explanation would appear to fit with current literature, as McIlvane (2001) stated that osteoarthritis (a chronic pain condition) was viewed as a non-normative life event in middle age but as a normative life event in old age. This could therefore result in greater acceptance amongst older patients, and this acceptance has been reported to favour rehabilitation and help patients change pain-related behaviours (Busch, 2005). For these reasons, age was identified as a possible confounding variable within this thesis. Gender was also identified as a possible confounding variable due to gender differences in the use of several of the coping strategies. It was found that women utilised more cognitive and behavioural coping strategies than men, and had higher anxiety, but that men reported higher fear avoidance beliefs and depression. Keogh and Denford (2009) stated that sex differences are generally found in the perception and experience of pain, possibly due to socially-acquired gender-role expectations, and a number of studies have shown differences in pain coping between the sexes (see Chapter 6).

Although age and gender were identified as potential confounding variables, the largest associations with the demographic variables were found between employment status and coping, and between SES and coping. These associations were all in the

expected direction, with unemployment and low SES shown to be associated with poorer coping. This reflects the current literature (e.g. Tunks et al, 2008) and strongly suggests that some sort of relationship exists between these demographic variables and coping. Therefore employment status and SES were also identified as potential confounding variables.

Associations between coping and clinical variables were then examined. Similar findings were reported for both pain intensity and disability, showing that increases in these outcomes (i.e. higher pain intensity and higher levels of disability related to back pain) were associated with poorer coping. This is again as expected, and reflects the findings of studies in this area (see Chapter 6). Current literature takes for granted the link between pain and disability (Horgas et al, 2008), but researchers have identified the importance of investigating this further. For example, Turner et al (2004) stated that "a clearer understanding of how pain intensity relates to disability could have important implications for pain treatment goals and definitions of treatment success" (pg. 307). Some previous research has suggested that the relationship between pain and disability is non-linear, in that only pain rated greater than 5 on a 0 to 10 scale is associated with disability (Jensen et al, 2001; Serlin et al, 1995; Von Korff, 2001). However further work is necessary, particularly in the area of how pain and disability relate to patient coping. The similarities found here between pain and disability in their associations with coping add to the literature by identifying possible avenues for further research, such as investigating the prospective relationship between coping and outcome in order to determine whether this is dependent on the outcome variable assessed or whether, as suggested here, there is little difference

between pain and disability. This is important as, if the latter were found to be the case, it could be concluded that studies investigating coping with low back pain would not benefit from investigating more than one outcome variable.

Associations were also found between the coping variables and pain duration, with greater duration of pain shown to be associated with poorer coping. The three-year duration point was found to be particularly important, adding to the findings of Dunn and Croft (2006) who reported significant differences in coping between patients with more or less than three years duration. This highlighted another potential avenue for further investigation, as the underlying reasons for these findings remain unclear (Dunn and Croft, 2006). Holmes and Stevenson (1990) stated that the relationship between coping and pain duration affects patient adjustment to pain. The findings in Chapter 6 go some way to support this, and suggest that not only is pain duration a possible confounding variable in the relationship between coping and outcome, but investigating its interaction with coping in the prediction of low back pain outcome would seem also to be an interesting avenue for further research.

Inter-correlations were found between most of the baseline coping variables, with the exception of active coping where only a few small associations were found. The direction of these associations was sometimes unexpected (i.e. greater active coping was associated with greater passive coping) which, along with the small magnitude of the associations found, suggested that the measure of active coping used could be flawed. This possibility raised an issue for the thesis in that results related to active coping might be unreliable. The inter-correlations found between most of the other coping variables suggested that they are not independent of one another, highlighting

the need for prospective analyses to combine all coping variables into predictive models to ensure that only independent effects are reported, such as in Foster et al (2010).

In summary, Chapters 3 and 6 provided information that addressed the third aim of this thesis. Baseline characteristics of the sample were documented to describe the BeBack sample and highlight the similarities between BeBack and other primary care low back pain cohorts, showing that the results of this thesis are likely to be able to be generalised with some confidence to other primary care patients. Cross-sectional analyses provided the first opportunity within the thesis to examine interactions between coping and other variables. These findings provided the basis of the later prospective analyses and identified potential confounding variables that, where necessary, needed to be considered and controlled for in the prospective analyses. With this information ascertained, the fourth overall aim of this thesis could be addressed.

9.2.4. Fourth aim

The fourth aim was to determine which coping factors are independent predictors of low back pain outcomes for primary care patients and to examine whether changes over time in these predictors are important. Chapter 7 addressed this aim by examining each of the coping variables to determine whether they were independent predictors of future pain and disability. Chapter 8 also addressed this aim by investigating whether change in coping over time was predictive of future pain and

disability, and whether pain duration was an important factor in this predictive relationship.

Chapter 7 began by examining unadjusted associations between the baseline coping variables and 12-month pain intensity/disability, which were mostly found to match the cross-sectional associations reported in Chapter 6. The associations between the baseline coping variables and 12-month pain intensity/disability were then examined whilst controlling firstly for demographic variables and then for demographic variables and pain duration. This revealed that there was some confounding at work, as some significant variables became non-significant (i.e. diversion and cognitive coping on disability), and some non-significant variables became significant (i.e. active coping on both pain intensity and disability). Possible reasons for these confounding effects were highlighted (see Chapter 7), and then all coping variables that were still significantly predictive of low back pain outcome following adjustment for confounders were included within multiple regression analyses to determine independent effects. Within these models, only three variables emerged as significant independent predictors of pain intensity (depression, catastrophizing, passive behavioural coping) and only four variables were significant independent predictors of disability (depression, self-efficacy, passive behavioural coping, anxiety). This shows that cognitive and behavioural coping strategies, mood, and belief factors were all found to be important aspects of coping that independently predicted low back pain outcome, therefore providing support for the diagram of ‘coping’ as an overall concept that was proposed in Chapter 1 of this thesis. The findings also reflect those of the systematic review (see Chapter 2). It can therefore

be concluded that the review findings are an accurate representation of the coping-related factors that affect low back pain outcome. There was, however, one major difference between the findings reported in Chapters 2 and 7. The systematic review in chapter 2 identified fear avoidance beliefs as the most important independent predictor of low back pain outcome (a consistent finding amongst studies in the field), whereas the multivariate regression model in Chapter 7 found that fear avoidance beliefs did not independently predict low back pain outcome. It was concluded that the findings reported in Chapter 7 were the more accurate in relation to fear avoidance beliefs, as most of the studies included within the systematic review only focused on a limited number of factors and therefore did not control for other coping factors that were shown in Chapter 7 to be confounders of the relationship between fear avoidance beliefs and low back pain outcome. The findings reported in Chapter 7 support those of Foster et al (2010) in that they highlight redundancy in the measurement of psychological factors, particularly fear avoidance beliefs. This, along with the findings of Foster et al (2010), reflects a new dimension to the coping literature and highlights the importance of measuring an array of coping factors to account for redundancy due to confounding in the prediction of low back pain outcome. It also raises a question as to the utility of Vlaeyen et al's (1995) fear avoidance model in primary care low back pain patients. This model depicts how painful experiences can lead to disability and increased pain through the cycle of catastrophizing leading to fear, which in turn leads to avoidance and subsequent disability. This is one of the leading models within the field, however Chapter 7 of this thesis suggests that the model may not hold true for primary care patients with low

back pain. If fear avoidance beliefs are not actually independently predictive of disability, then there must be some other coping variable that was not measured by Vlaeyen et al (1995) that can account for the reported prediction of disability. In particular, self-efficacy and passive behavioural coping were not mentioned at all within the Vlaeyen et al (1995) study and could therefore be implicated within the model. This opens up several new avenues for further research in testing the various different pathways of the Vlaeyen et al (1995) model to accurately determine predictive effects in this patient population.

The additional percentage of the variance in 12-month pain intensity/disability explained by the coping variables was relatively high (15% and 20%, respectively) and could be clinically important. However when combined with the demographic and clinical variables, the models were able to predict much higher percentages of the variance. This highlights the importance of these variables in addition to the coping factors and the need to incorporate them within future coping models and account for them within pain management interventions. Only two of these variables emerged as significant independent predictors of low back pain outcome (employment status and pain duration), but these variables were found to be highly statistically significant predictors of both pain intensity and disability at 12-months follow-up. Although pain duration cannot easily be modified, it might be helpful for healthcare professionals to encourage unemployed patients into or back to work, or to refer them on to employment services for further help in finding employment. It would also be helpful to further investigate pain duration to determine whether patients with differing durations would benefit from slightly different interventions. This underscores the

importance of examining how coping changes over time and the impact this has on low back pain outcome.

A comparison of the independent predictors of both pain intensity and disability revealed that although there were some similarities (passive coping and depression had an overall negative effect on both outcome variables), there were also substantial differences. When examined more closely from a theoretical viewpoint, the reasons for these differences seemed clear and they highlighted the distinction between pain intensity and disability as outcomes of low back pain. Most previous research has tended either to focus on a single outcome variable, or to examine several outcome variables but with no attempt to theoretically examine the differences in the prediction of these variables, therefore revealing little about how different outcome variables relate to one another. This thesis therefore adds to the literature by comparing the predictors of pain intensity and disability and drawing theoretical conclusions based on this comparison. For example, it is recommended that pain intensity and disability are examined separately in future research studies and not assumed to be parts of the same variable (e.g. ‘outcome’). This is a positive recommendation in terms of designing pain management interventions, as it suggests that we can target and potentially improve one outcome variable without having to do anything to affect the other. For example, we can focus on improving patient disability even when pain intensity remains unchanged. Therefore, we can still potentially improve the lives of patients who show no improvement in their levels of pain intensity over time. Thus the major focus on disability, characteristic of tertiary care management and evidenced in

interdisciplinary pain management programmes (Main et al, 2008), also appears to be of relevance to the needs of primary care populations.

Chapter 8 began by considering how an important increase or decrease in coping over time might be identified. After establishing the advantages and disadvantages of current approaches, it was argued that distribution-based methods are preferable, particularly within the context of this thesis due to the limitations associated with anchor-based methods (e.g. bias, validity and reliability issues) and the lack of an available anchor for some of the coping measures used. It is important to note that there is currently no universally agreed method of determining an important change in coping, and this could be the reason why so little research has been carried out to investigate change in coping over time. Evidence for the utility of the 0.5 SD method (Norman et al, 2003) was examined, and this method was chosen for use within Chapter 8 of the thesis. Therefore, patients were grouped according to whether or not their coping change was equal to or greater than 0.5 SD at baseline on the particular coping measures used.

Adopting this criterion, it was found that a relatively high percentage of patients did not change over time. This is to be expected within a primary care sample, since usual primary care for this group does not usually include specific coping-related interventions. Coping stability over time has been reported for a variety of conditions, such as sickle cell disease (Gil et al, 1992) and Parkinson's disease (Frazier, 2002), and has even been reported for people coping with stressful life events (Thompson, 1985). Therefore it would appear that without targeted intervention, coping is likely to remain stable over time (at least 12 months, as measured in the BeBack dataset).

There were, however, several exceptions within this study, with many patients (between 42.7% and 69.9%) showing increases or decreases in coping strategy use over time. It is these patients that provided the focus for Chapter 8 of this thesis. Amongst these patients, the general tendency was towards coping improvement rather than worsening over time. This is a positive finding, showing that low back pain patient coping is more likely to remain stable or improve than it is to get worse. This is in-line with the fact that many primary care low back pain patients show rapid improvement in pain/disability after initial consultation (Carey et al, 1995; Pengel et al, 2003). However, it is frequently reported that it is the small percentage of patients with chronic pain who appear to worsen and subsequently account for most of the economic costs associated with the condition (Maetzel and Li, 2002; Watson et al, 1998). Therefore, even though the percentage of patients whose coping worsens over time is relatively small, this subgroup is nevertheless very important, clinically and economically.

Patterns of change were examined and it was found that changes in coping tend to occur together in the same direction (e.g. towards improvement). It was also found that the confounding variables (employment status and pain duration) were associated with how coping changed over time. These associations were in the expected direction, with employed patients and those with more acute pain problems showing more positive changes in coping over time. Several possible explanations for these findings were proposed. For example, it was suggested that employment could lead to more positive changes because employed patients are more active as a result of work, or because employment might serve as a source of distraction from the pain.

Similar explanations have been suggested previously. For example, Jahoda (1982) stated that employment provides enforced activity and a structure to time, and Fryer (1986) argued that the financial limitations of unemployment restrict the ability to exercise control over life and to make plans for the future, which could be reflected in the patterns of coping change exhibited. With regards to pain duration, those patients entering the study with longer durations of back pain were shown to belong to the 'no change' coping groups more often than those with shorter durations, indicating that they require more assistance to enable them to change their coping strategy use over time.

Interestingly, it was found that coping worsening over time was significantly related to low back pain outcome (resulting in greater pain and disability), but that in most cases, those patients whose coping improved over time did not differ significantly in terms of their outcomes from patients whose coping did not change. This has also been found in previous research, with studies failing to show that teaching patients to use positive coping strategies leads to improved outcomes (Leyshon, 2009). Therefore it is possible that pain management programs produce beneficial effects through the discouragement of maladaptive or passive coping strategies, rather than the encouragement of positive ones (Heapy et al, 2005). Coping worsening was then examined further and it was found to explain 30% of the variance (an additional 6.8% of the variance after controlling for confounding variables) in 12-month pain intensity scores and 36% of the variance (an additional 9.7% of the variance after controlling for confounding variables) in 12-month disability scores. Anxiety, catastrophizing and passive behavioural coping emerged as independent predictors. This contradicts

previous research reporting that change in coping showed poor prognostic relevance (Pfingsten et al, 1997). However it provides further support for findings of the systematic review conducted earlier in the thesis (see Chapter 2), which reported that patients with rising levels of pain-related fear over time were more disabled at follow-up (Sieben et al, 2002). Although fear avoidance beliefs did not emerge within this thesis as independently predictive, Sieben et al (2002) highlight the relationship between coping worsening over time and poor outcome that was identified here and provide further support for the decision made within Chapter 8 to focus on coping worsening. It was suggested that coping worsening can lead to a vicious circle of spiralling severity that would explain the predictive effects shown here. This idea is novel and provides a theoretical foundation for recommending that interventions might be better targeted towards those patients whose coping appears to be worsening over time.

Holmes and Stevenson (1990) called for more longitudinal studies examining the use of coping strategies over time, stating that these may help to clearly define the relationship between coping and outcome. However almost 20 years later, Leyshon (2009) stated that “although coping is a dynamic process and can change in different situations, not enough is yet known about how coping changes over time” (pg. 369). Therefore, little has been done to address the recommendations of Holmes and Stevenson (1990) in recent years. The analyses presented in Chapter 8 here attempt to address this neglected area and provide a basis for further research. Thus after establishing that coping worsening over time is predictive of low back pain outcome whereas coping improvement generally is not, further analyses were performed to

investigate the interactions between coping, the confounding variables (employment status and pain duration), and outcomes in order to address the point made by Leyshon (2009) and provide a more in-depth understanding of how change in coping over time produces the effects that have been observed here. It was found that pain duration predicted the worsening of depression and passive behavioural coping, whereas employment status was not predictive of coping worsening over time. Although previous studies have shown associations between pain duration and depression (e.g. Altindag et al, 2006; Demmelmaier et al, 2008), there have been no previous attempts to investigate the relationship between pain duration and the worsening of depression over time, reflecting the fact that there has been little previous research on change in coping at all. This finding therefore, along with the subsequent analyses presented in Chapter 8 of this thesis, suggests new avenues for research with the potential for improving both the understanding, and ultimately the management, of low back pain.

It was found that depression and passive coping worsening were partial mediators of the relationship between pain duration and outcome, showing that pain duration still also had a direct effect on outcome. Pain duration is not easily modifiable, but this finding shows that healthcare professionals can negate its effects to some extent by focusing on preventing the worsening of depression and passive coping over time.

It was also found that pain duration was associated with baseline levels of anxiety, depression, catastrophizing, and self-efficacy (which have all been shown to predict low back pain outcome). It was argued that the notion of a patient's specific pain trajectory could explain their baseline scores (e.g. determining their pain duration and

the way in which they try to cope with their pain before presenting in primary care). The notion of pain trajectories suggests that patients are destined to present in a pre-determined way, therefore implying that this cannot be altered. However it would appear that there are things that can be done to improve low back pain outcome, despite the notion of a set pain trajectory. In fact with further investigation, we could potentially highlight specific pain trajectories and identify patients for intervention based on the trajectories they present with in primary care. It is therefore important to assess pain duration and coping at initial consultation and to continue to assess coping over the course of the pain problem to identify those patients who are at increased risk of poor outcomes. The administration of standardised coping measures may not be realistic within primary care consultations due to time restraints, however it would be possible for GPs to assess patient coping using a few broad questions to give a general idea of the type and level of coping that patients are using.

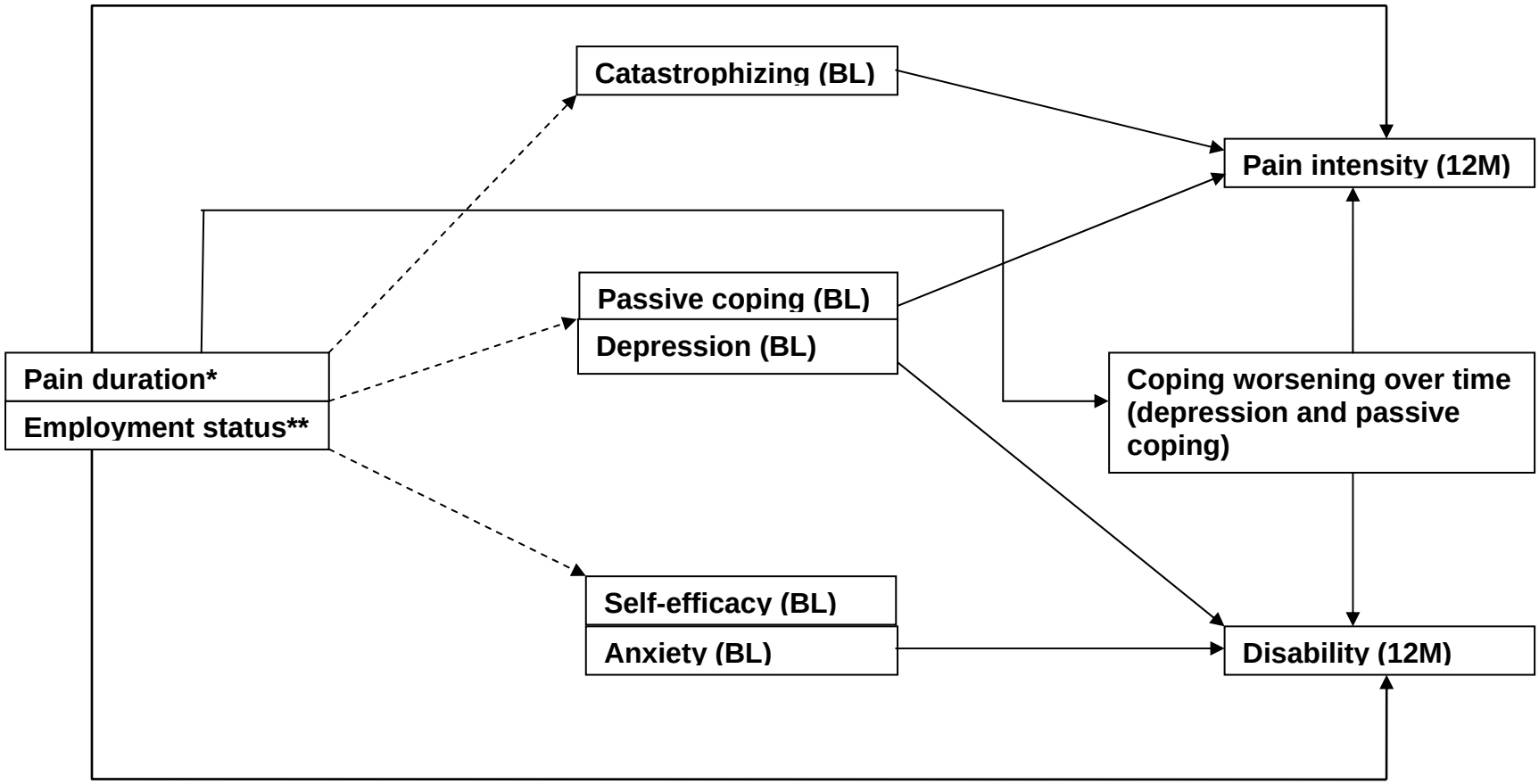
In summary, Chapters 7 and 8 provided longitudinal information that addressed the fourth aim of this thesis. Important independent predictors of low back pain outcomes within this sample were identified, and change in coping over time was examined and found to independently predict low back pain outcome and also to impact on the relationship between pain duration and outcome. These findings provided key information to enable the development of a coping model, which will be reported within this chapter (see section 9.2.5.) in order to address the fifth overall aim of this thesis.

9.2.5. Fifth aim

The fifth aim was to develop a coping model relevant to primary care low back pain that explains relationships between key variables, and to use this model to provide key recommendations that can inform further research and clinical practice. The longitudinal findings from Chapters 7 and 8 were utilised to develop a coping model showing the interrelationships between all of the key variables that have emerged throughout this thesis and how they can be used to predict low back pain outcomes at 12-months follow-up (see figure 9.1).

Figure 9.1 shows the interrelationships between the key variables that have emerged within this thesis. It shows the five baseline coping variables (centre column) that are independently predictive of low back pain outcomes (as discussed in Chapter 7), and highlights which coping variables are predictive of which outcome variables. Baseline pain duration and employment status are shown (left column) as the demographic/clinical factors that have consistently emerged as important throughout this thesis. Broken arrows depict associations between these factors and the five coping variables at baseline, and block arrows depict independently predictive effects of these factors on pain intensity and disability at 12 months follow-up. This highlights the fact that these demographic/clinical factors are predictive of outcome regardless of their associations with coping at baseline and that future research should consider these factors as important independent predictors of low back pain outcomes.

Figure 9.1: A model explaining relationships between key variables that are associated with low back pain outcome#



- - - - - - - - - - → = associations
*Not associated with passive coping
** Not predictive of coping worsening over time
BL = baseline
12M = 12 months follow-up

Variables measured at 12 months follow-up are shown in the right-hand column. These include the two outcome variables, and coping worsening over time. Figure 9.1 shows that coping worsening over time is directly predictive of both pain intensity and disability at 12 months, but that it is also mediating the relationship between pain duration and these outcome variables (as discussed in Chapter 8). So pain duration predicts how coping changes over time, which in turn predicts low back pain outcomes.

This model is useful because it integrates the previously reported major findings into one figure, thereby providing researchers and healthcare practitioners with an easily interpretable reference that might be used to help design future research studies and/or pain management interventions.

Recommendations for research and practice

It is clear from looking at the coping model (see figure 9.1) that pain duration and employment status are associated with coping at baseline and are also independently predictive of outcomes at 12-months follow-up. In addition, pain duration also predicts coping worsening over time. These demographic/clinical variables are clearly important in determining how patients cope initially, as well as over the course of their pain problem, and in determining self-reports of pain intensity/disability at 12-months post-consultation. There are considerable time constraints within primary care consultations, however these demographic/clinical variables can be quickly and easily assessed using single questions to determine whether patients are at risk of poor

outcomes (i.e. those patients who are unemployed and/or have longer pain durations). At-risk patients could then be referred on for more specialist help for example with coping-related interventions and support in seeking and sustaining suitable employment, hence providing a time and cost effective method of screening patients for intervention. Further research could also examine pain duration in more detail, perhaps through the use of clinical trials to determine the types of interventions that are best suited to the different pain duration groups. This could lead to service designs that involve screening of patients for specific interventions, which would be beneficial for patients and healthcare professionals alike due to the potential elimination of the current often 'trial and error' method of patient selection for different treatments. The importance of pain duration has also been identified previously, with researchers recommending its use as a grouping variable within treatment interventions for low back pain patients. For example, Holmes and Stevenson (1990) stated that it would be efficacious to devise individualised treatment plans based on pain duration and the coping strategies that are related to pain duration.

Figure 9.1 distinguishes pain intensity and disability as two separate outcome variables, and it is recommended that future research studies also examine these variables separately, as they occur independently despite the reported associations between them. This thesis has shown that pain intensity and disability at 12-months follow-up are predicted by different sets of coping factors. Differences in the prediction of these outcomes underscore the important distinction between them, which provides researchers and healthcare professionals with a very positive message regarding the potential to help chronic low back pain patients. This should

encourage primary care clinicians to begin to move beyond the traditional aim of improving the levels of pain that patients experience and focus more on improving patient disability in the context of persisting pain. Clearly an improvement in pain would be desirable, but for many patients this pain does not significantly improve over time and they become increasingly more disabled as a result. This thesis shows that it is still possible to intervene to improve disability even when pain intensity does not improve over time. For example, cognitive behavioural techniques can help patients to think differently about their pain and learn to cope in a more positive way to reduce the impact that pain has on their daily lives (Sanders, 2006; Turner and Clancy, 1986).

Figure 9.1 shows that only a small number of coping factors are independently predictive of low back pain outcomes, and Chapter 7 of this thesis showed that these factors can account for the predictive effects of other variables that have been identified by studies examining only a limited selection of variables (e.g. many of the studies included within the systematic review, see Chapter 2). The redundancy of many coping-related factors in the prediction of low back pain outcome highlights the need for future studies to measure an array of coping factors in order to account for confounding and reveal only independent predictors. Once researchers begin to do this, it is recommended that the systematic review (see Chapter 2) is updated to include new and hopefully more accurate studies of independent predictors, thus providing a more accurate account of the relative importance of the various coping-related factors. The redundancy of many coping factors also highlights a potential problem with Vlaeyen et al's (1995) fear avoidance model, in that fear avoidance

beliefs were found here to be one of the redundant factors in the prediction of low back pain outcomes (see Chapter 7). Vlaeyen et al's (1995) model places emphasis on the pathway from fear and avoidance to subsequent disability, however this thesis suggests that this pathway could in fact be explained by alternative coping factors such as self-efficacy rather than fear avoidance beliefs. The role of self-efficacy and passive behavioural coping should be examined further, as these factors emerged from this thesis as important predictors, yet have been omitted from previous research by Vlaeyen et al (1995). Previous research has also shown the importance of self-efficacy, outlining its potential for modification (Dionne et al, 2007) and its utility as a target within interventions (Bodenheimer et al, 2002; Lorig et al, 2001). Asghari and Nicholas (2001) reported that enhanced pain self-efficacy has been achieved through cognitive behavioural pain management programmes and that these programmes incorporate training in problem-solving, pacing, and relaxation, as well as patient reinforcement for increasing exercise and gradual medication withdrawal. Bodenheimer et al (2002) stated that self-efficacy is enhanced and clinical outcomes are improved when patients succeed in solving patient-identified problems, thus the teaching of problem-solving skills within pain management programmes is important. Further support for this comes from Lorig et al (2001), who reported that their 'Chronic Disease Self-Management Program', which was based on self-efficacy theory and emphasized problem-solving, decision making, and confidence building, was successful in improving health behaviours (e.g. exercise), self-efficacy, and health outcomes (e.g. pain and distress).

Although baseline coping was found to be predictive of low back pain outcomes at 12-months follow-up, this thesis also found that the worsening of some coping variables over time was also predictive, and this was regardless of the original (baseline) levels of coping (see figure 9.1). So it is not only the initial level of coping, but the worsening of this initial level that is predictive of low back pain outcomes 12 months later. It was also found that coping improvement over time was not particularly important in the prediction of outcome (see Chapter 8), therefore it is recommended that future research should focus on coping worsening rather than change in either direction. This suggests several potential avenues for further research, with questions such as 'do the predictive effects of coping worsening differ in magnitude depending on the initial level of coping at baseline?', 'Why were the effects of worsening in some coping variables not predictive of outcome: Did baseline levels of coping have an impact here?'. A theoretical explanation for the importance of coping worsening (rather than improvement) was proposed. It was suggested that patients enter a vicious circle of spiralling severity (coping and outcomes), and this results in greater pain intensity and disability at 12-months follow-up. Future research could test this theory by assessing patients frequently over the 12-month period to determine if a worsening of pain or coping triggers this cycle of gradually increasing severity over time. It is also recommended that assessment of change in coping over time should be carried out in clinical practice, and interventions should be targeted towards patients whose coping worsens over time, as they are most at risk of poor longer-term pain and disability outcomes. These interventions should focus mainly on preventing coping worsening, rather than teaching patients how to improve their

coping. Previous research has already acknowledged the fact that the beneficial effects of current pain management programs occur through the discouragement of negative strategies, rather than the encouragement of positive ones (Heapy et al, 2005), therefore the findings of this thesis appear to fit with previous research in suggesting a clinical focus on negative strategies and worsening over time.

Figure 9.1 shows a pathway of prediction from pain duration to low back pain outcomes, with coping worsening (specifically the worsening of depression and passive coping) emerging as a partial mediator of this relationship. These findings are novel and replication is required in different samples to substantiate the recommendations made here. This is potentially a very important area for future research, revealing that although pain duration cannot easily be modified for individual patients, it might be possible to reduce its effects by targeting the variables that it influences. It might even be possible to assess pain duration, use this to select those patients who are at risk of poor outcomes, and subsequently target those patients with interventions aimed specifically at preventing the worsening of depression and passive coping over time.

It was also suggested that the point at which patients consult in primary care might be determined by their specific pain trajectories. The idea of pain trajectories was previously discussed by Dunn et al (2006), who identified recovery trajectories that they claimed might represent phases in the long-term course of low back pain. If this were in fact the case, pain trajectories could be used to explain baseline scores, coping change, and eventual outcomes. The notion of pain trajectories is that they are pre-determined and relatively stable. But does this mean that we cannot intervene to

divert a potentially chronic pain patient away from a pathway leading to poor long-term outcome? Further research is needed in this area to determine how changeable pain trajectories might be, and indeed, to determine various different trajectories that patients might present with in order to identify these pathways at initial primary care consultation. It is also important for this research to follow patients up for longer periods of time, as 12 months is unlikely to be sufficient to observe the complete course of the low back pain problem. Continued and frequent assessment is essential in order to develop knowledge of pain trajectories and establish more effective methods of intervention, yet is complex to operationalise in busy primary care practice.

9.3. Strengths and limitations

It is important to acknowledge the strengths and limitations of this thesis in order to reveal any potential impact these may have on the results and subsequent recommendations made here and to guide further research to be of the highest quality possible.

9.3.1. Limitations

One potentially important limitation is that of selection bias within the BeBack study sample. It is likely that those patients with more severe pain problems may have been more likely to respond to the baseline and follow-up questionnaires, and it has been

shown that baseline responders were older and more likely to be female than non-responders (Foster et al, 2008). It is also likely that those patients who recovered quickly following primary care consultation would be less likely to respond to further questionnaires, despite the study information clearly stating that their response was still of interest to the research. It was not possible to establish the extent of any potential differences within the context of this thesis, however it is encouraging that the baseline demographic and clinical variables were considerably varied across the sample and therefore it would seem reasonable to suggest that this type of selection bias would not have affected the results to a great extent. Sample attrition (i.e. loss to follow-up due to non-response) is often a major study limitation as well, however within the BeBack study, the adjusted six month response rate (of patients who had completed the baseline questionnaire and consented to follow-up) was 64.6%, and the adjusted 12 month response rate (of patients who had completed the six month questionnaire and consented to follow-up) was an impressive 89.4%. Therefore sample attrition was not deemed to be a major problem for this study.

Another limitation of this thesis was its use of secondary data. This meant that it was not possible to select new, specific variables to be measured within the study. This could have impacted on the thesis in several ways. Firstly, although multivariate statistical techniques were utilised to minimise confounding, it is possible that confounding due to other variables (e.g. those not measured within the study) still occurred. If the opportunity to design the study had been given, it would have been possible to incorporate the measurement of all variables emerging from the literature review (see Chapter 1) and the systematic review (see Chapter 2) as potentially

important (e.g. negative affect and passive cognitive coping). So it is possible that confounding had an impact on the results of this thesis, although the extent to which this might have occurred is not known.

When developing the new measure of behavioural coping (see Chapter 4), the use of secondary data meant that the items for potential inclusion were limited to those that were measured within the BeBack study. Examination of the 'other' free responses revealed that several popular behavioural coping strategies had been missed by the BeBack questionnaire (e.g. normal activities, specific sports or exercise, use of TENS machine), thus limiting the comprehensiveness of the measure in its assessment of behavioural coping. However despite this, the 'passive coping' subscale did emerge as important throughout this thesis. Therefore it would appear that the passive behavioural coping items included within the measure were sufficient to enable accurate assessment, however further development of the measure with a wider set of behavioural coping items would be advantageous.

Another limitation associated with using the behavioural coping measure is its lack of validation in other samples, making comparison of findings impossible. This is clearly unavoidable due to the development of the measure within this thesis (see Chapter 4), but it is advised that the measure is used in future research and that the findings are compared, enabling evaluation of the measure's validity.

The BeBack study data that was utilised throughout this thesis was collected via self-report questionnaires. This presents a further potential limitation of the thesis, as the accuracy of self-report measures has been shown to be questionable. For example, Kremer et al (1981) found that patient reports of physical activity and social

behaviour differed from staff observations, thus recommending that the efficacy of therapeutic intervention should be determined by systematic observational data rather than patient self-reports. However, the vast majority of published studies in this area utilise self-report measures. This is probably due to their ease of use and their time and cost effectiveness, and implies that they are acceptable for use within the field. Therefore it was felt that when comparing the findings of this thesis with other literature, the use of self-report measures was not hugely problematic.

Finally, the recent distinction between moderators and mediators in the field of low back pain (Hill and Fritz, 2011) is of importance in considering how to link baseline assessments with the design of interventions. While the data in this thesis has clearly illustrated the role of coping factors as prognostic and potentially modifiable variables, the design of future coping-related intervention studies needs to take into account the differences between prognostic factors (factors that help estimate a patient's likely outcome irrespective of treatment), treatment effect modifiers or moderators (factors measured at baseline that influence the relationship between intervention and outcome), and treatment mediators (factors that have an intermediary role in the link between a specific treatment and outcome) (Hill and Fritz, 2011).

9.3.2. Strengths

Despite the limitations discussed above, this thesis also has many strengths. Firstly, the BeBack study provided data for a large number of baseline responders, which gave high statistical power to many of the analyses. The volume of baseline data

collected was in part due to the inclusive method of screening patients (i.e. all patients presenting in primary care with a Read code indicating non-specific low back pain were asked to participate), which ensured that the vast majority of eligible patients were included in the initial mailing of the baseline questionnaire. The results can therefore be generalised with some confidence to other primary care low back pain patients.

The use of popular measurement instruments with confirmed reliability and validity (with the exception of the new behavioural coping measure) enabled the results of this thesis to be compared with other studies in the field whilst minimising measurement errors. In addition, the longitudinal design enabled the examination of cause and effect, highlighting important predictors of outcome and enabling the investigation of how coping changes over time and the impact of this change.

The main strength of this thesis is its comprehensiveness in its investigation of the role of coping in primary care low back pain patients. This thesis proposed a definition of ‘coping’ as an overall concept that can be inferred not just from coping strategies, but also from other coping-related factors such as mood and beliefs (see Chapter 1). Truchon and Fillion (2000) argued that future studies are necessary to confirm the importance of psychological variables, including attitudes and beliefs as well as coping strategies, and to specify the nature of the interrelationships among them to enable the integration of these interrelationships into a conceptual framework. This thesis addresses these recommendations by providing detailed and novel information relating to coping strategies, mood, and belief factors, and integrating this information into a coping model depicting the interrelationships between these key variables. This

enabled the provision of key recommendations for future research and clinical practice, and thus demonstrates how the results of this thesis can be applied to further the development of understanding and practice within the field.

9.4. Conclusions

In conclusion, this thesis has provided a comprehensive examination of coping with low back pain amongst primary care patients. Several novel findings were presented that could be taken forward to inform future research and the clinical management of low back pain patients.

The systematic review (see Chapter 2) highlighted how researchers have previously neglected the role of behavioural coping, as evidence relating to this coping factor was very limited. In response to this finding, a new measurement instrument was developed to measure behavioural coping comprising two subscales ('active' and 'passive' behavioural coping) (see Chapter 4). The publication of this measure could potentially enhance the field of coping research as it provides the first internally consistent measurement tool for behavioural coping, which could be easily incorporated within coping questionnaires for future research with low back pain patients.

A detailed analysis of cognitive coping (see Chapter 5) highlighted discrepancies between the exploratory and confirmatory factor analysis techniques, indicating that there might be methodological problems associated with the use of confirmatory

factor analysis. This chapter concluded that the original factor structure of the CSQ-24 was appropriate for use within this thesis.

Analysis of baseline demographic, clinical and coping variables revealed that the sample used here (BeBack) was typical of other primary care low back pain patient samples and thus can be generalised with some confidence to other primary care low back pain patients (see Chapter 3). It was also identified that age, gender, employment status, SES and pain duration were potential confounders of the relationship between coping and outcome and that the coping variables were not necessarily independent of one another (see Chapter 6).

Longitudinal analyses revealed that only three coping variables (depression, catastrophizing, passive behavioural coping) were independently predictive of 12-month pain intensity and only four coping variables (depression, self-efficacy, passive behavioural coping, anxiety) were independently predictive of 12-month disability (see Chapter 7). Interestingly, fear avoidance beliefs did not independently predict low back pain outcome. This contradicts the findings reported within the systematic review (see Chapter 2) and suggests that redundancy in the measurement of fear avoidance beliefs occurred due to the wide range of other coping factors that were investigated. This illustrates a limitation in the original fear avoidance model (Vlaeyen et al, 1995), and indeed in many previous studies that only examined a limited number of variables. As pain intensity and disability emerged as distinct outcome variables with different sets of independent predictors, it was concluded that we could potentially target one of these outcome variables with an intervention that does not necessarily have to affect the other but may yet be of therapeutic benefit.

It was found that coping worsening over time predicted low back pain outcome (see Chapter 8) and it was suggested that this effect could be brought about through a vicious circle of spiralling severity that can result from a small worsening of coping and/or pain over time. In particular, the worsening of depression and passive behavioural coping was found to partially mediate the relationship between pain duration and outcome. This suggests that these are important variables for inclusion in future research and clinical assessments, as it might be possible to reduce the effects of pain duration by targeting these variables.

A coping model was developed showing all the interrelationships between key variables that have emerged throughout this thesis (see Chapter 9). Although only a first step, it is hoped that it might help to direct and focus new lines of research into the influence of pain coping on low back pain treatment outcome. Further research would seem to be merited on the role of coping variables, and indeed other prognostic variables, both as moderators of outcome and as treatment mediators.

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Appendix 1: BeBack questionnaires

(i) Baseline

KEELE
UNIVERSITY

BeBack

Beliefs about Backpain Study

Assessing your back problem

- When completing this questionnaire, please try to be as accurate and honest as you can throughout. There are no 'correct' or 'incorrect' answers. Answer according to your own feelings, rather than how you think most people will answer. Try not to let your answer to one question influence your answers to other questions.
- Please return this questionnaire in the envelope provided. **You do not need a stamp.**
- If you have any further questions about this questionnaire or the study in general, you can telephone Annette Bishop on 01782 583921 during office hours.

Thank you for your help with this important research study

INSTRUCTIONS FOR THIS QUESTIONNAIRE

Please answer **all** of the questions, even if you feel that they do not apply to you. Some of the questions are arranged in sections according to the period of time that they ask about. Some questions may look like others, but each one **is different.** Some of the questions are about you and some are about your back pain or how you feel about your back pain. Please take the time to read and answer each question carefully.

Most of the questions can be answered by putting a **cross** in a box next to or under your answer. For example, if you wish to answer 'Not at all', **cross** the box like this:

Not at all	Slightly	Moderately	Very much	Extremely
☒	☐	☐	☐	☐

Here is an example of how to answer a question if you **don't** have any pain:

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10
☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Now please continue and fill in this questionnaire.

Section 1 – Your back problem

Part A - **For this first set of questions, please think about your back pain in the last 6 months.**

1. In the **last 6 months**, how intense was your **worst** back pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2. In the **last 6 months**, on **average**, how intense was your back pain rated on a 0-10 scale, where 0 is 'no pain' and 10 is 'pain as bad as could be'? (That is, your usual pain at times you were experiencing pain.) *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. About how many **days** in total in the **last 6 months** have you been kept from your **usual activities** (work, study or housework) because of your back pain? *(Please cross one box)*

0 days	☐
1-6 days	☐
7-14 days	☐
15-30 days	☐
31 days to 3 months	☐
More than 3 months	☐

4. In the **last 6 months**, how much has your back pain **interfered** with your **daily activities** rated on a 0-10 scale where 0 is 'no interference' and 10 is 'unable to carry on any activities'? *(Please cross one box)*

No interference — Unable to carry on any activities

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Remember, these questions are about the **last 6 months**.

5. In the **last 6 months**, how much has your back pain **changed** your ability to take part in recreational, social and family activities where 0 is 'no change' and 10 is 'extreme change'?
(Please cross one box)

No change										Extreme change
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

6. In the **last 6 months**, how much has your back pain **changed** your ability to **work** (including housework) where 0 is 'no change' and 10 is 'extreme change'? *(Please cross one box)*

No change										Extreme change
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Part B – For the next set of questions, please think about the last 2 weeks

1. Has the pain from your back spread down one or both of your legs at any time in the **last 2 weeks**? *(Please cross one box)*

Yes ☐ No ☐

If yes; have you felt pain or numbness or pins and needles **below** your knee in the **last 2 weeks**? *(Please cross one box)*

Yes ☐ No ☐

2. Have you had pain in any of the following areas of your body in the **last 2 weeks**?
(Cross the box under all that apply)

Shoulder	Arm	Neck	Head	None
☐	☐	☐	☐	☐

Remember to think about the last **2 weeks**

3. In the **last 2 weeks**, how intense was your **most** painful back pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

4. In the **last 2 weeks**, how intense was your **least** painful back pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

5. In the **last 2 weeks**, on **average**, how intense was your **usual** back pain rated on a 0-10 scale, where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

6. If you have had pain in the last **two weeks**, how **bothersome** has your back pain been? *(Please cross one box)*

Not at all	Slightly	Moderately	Very much	Extremely
☐	☐	☐	☐	☐

Part C – For the next set of questions, please think about the last week

For the next questions, please read each item and **cross the box** of the reply that comes closest to how you have been feeling in the **last week.** Don't take too long over your replies; your immediate reaction to each item will usually be more accurate than a long thought out response.

1. I feel tense or wound up: *(Please cross one box)*

Most of the time	A lot of the time	From time to time, occasionally	Not at all
☐	☐	☐	☐

2. I still enjoy the things I used to enjoy: *(Please cross one box)*

Definitely as much	Not quite as much	Only a little	Hardly at all
☐	☐	☐	☐

3. I get a sort of frightened feeling as if something awful is about to happen: *(Please cross one box)*

Very definitely and quite badly	Yes, but not too badly	A little, but it doesn't worry me	Not at all
☐	☐	☐	☐

4. I can laugh and see the funny side of things: *(Please cross one box)*

As much as I always could	Not quite so much now	Definitely not so much now	Not at all
☐	☐	☐	☐

Remember to think about the last **week**

5. Worrying thoughts go through my mind: *(Please cross one box)*

A great deal of the time	A lot of the time	From time to time, but not too often	Only occasionally
☐	☐	☐	☐

6. I feel cheerful: *(Please cross one box)*

Not at all	Not often	Sometimes	Most of the time
☐	☐	☐	☐

7. I can sit at ease and feel relaxed: *(Please cross one box)*

Definitely	Usually	Not often	Not at all
☐	☐	☐	☐

8. I feel as if I am slowed down: *(Please cross one box)*

Nearly all of the time	Very often	Sometimes	Not at all
☐	☐	☐	☐

9. I get a sort of frightened feeling like butterflies in my stomach: *(Please cross one box)*

Not at all	Occasionally	Quite often	Very often
☐	☐	☐	☐

Remember to think about the last **week**

10. I have lost interest in my appearance: *(Please cross one box)*

Definitely	I don't take as much care as I should	I may not take quite as much care	Hardly at all
☐	☐	☐	☐

11. I feel restless as if I have to be on the move: *(Please cross one box)*

Very much indeed	Quite a lot	Not very much	Not at all
☐	☐	☐	☐

12. I look forward with enjoyment to things: *(Please cross one box)*

As much as I ever did	Rather less than I used to	Definitely less than I used to	Hardly at all
☐	☐	☐	☐

13. I get sudden feelings of panic: *(Please cross one box)*

Very often indeed	Quite often	Not very often	Not at all
☐	☐	☐	☐

14. I can enjoy a good book or radio or TV programme: *(Please cross one box)*

Often	Sometimes	Not often	Very seldom
☐	☐	☐	☐

Part D - The next set of questions are about you <u>today</u>

When your back hurts, you may find it difficult to do some of the things you normally do.

This list contains sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you **today**. As you read the list, think of yourself **today**.

When you read a sentence that describes you **today**, put a **cross** in the box next to it. If the sentence does not describe you today, then leave the box **empty** and go on to the next sentence. Remember, only cross the box next to the sentence if you are sure that it describes you **today**.

1. I stay at home most of the time because of my back…….. ☐

2. I change position frequently to try and get my back comfortable……. ☐

3. I walk more slowly than usual because of my back…….. ☐

4. Because of my back I am not doing any of the jobs that I usually do around the house……. ☐

5. Because of my back, I use a handrail to get upstairs……. ☐

6. Because of my back, I lie down to rest more often…….……... ☐

7. Because of my back, I have to hold on to something to get out of an easy chair…… ☐

8. Because of my back, I try to get other people to do things for me…… ☐

9. I get dressed more slowly than usual because of my back……. ☐

10. I only stand for short periods of time because of my back…… ☐

11. Because of my back, I try not to bend or kneel down…… ☐

12. I find it difficult to get out of a chair because of my back…….…….. ☐

13. My back is painful almost all the time…….. ☐

14. I find it difficult to turn over in bed because of my back……. ☐

15. My appetite is not very good because of my back pain…….…… ☐

16. I have trouble putting on my socks (or tights) because of the pain in my back…… ☐

17. I only walk short distances because of my back pain…… ☐

Remember to think about **today**

18. I sleep less well because of my back…….. ☐

19. Because of my back pain, I get dressed with help from someone else…….. ☐

20. I sit down for most of the day because of my back…….…….. ☐

21. I avoid heavy jobs around the house because of my back…… ☐

22. Because of my back pain, I am more irritable and bad tempered with people than usual…….. ☐

23. Because of my back, I go upstairs more slowly than usual…….. ☐

24. I stay in bed most of the time because of my back…… ☐

25. Is there one thing that is important to you, that you can usually do, that you are unable to do at the moment, because of your back pain? Yes ☐ No ☐

If yes, what is this important thing that you cannot do at present?

Please specify……..

26. How would you rate your back pain on a 0-10 scale **at the present time,** that is right now, where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Remember to think about **today**

By placing a cross in each group below, please indicate which statement best describes your own health state **today**. Do not cross more than one box in each group

27. Mobility

I have no problems in walking about……. ☐

I have some problems in walking about……. ☐

I am confined to bed…….. ☐

28. Self-care

I have no problems with self-care…….. ☐

I have some problems washing or dressing myself…… ☐

I am unable to wash or dress myself…….. ☐

29. Usual activities (e.g. work, study, housework, family or leisure activities)

I have no problems with performing my usual activities…….. ☐

I have some problems with performing my usual activities…….. ☐

I am unable to perform my usual activities…… ☐

30. Pain / discomfort

I have no pain or discomfort…….. ☐

I have moderate pain or discomfort…… ☐

I have extreme pain or discomfort…….. ☐

31. Anxiety / depression

I am not anxious or depressed…… ☐

I am moderately anxious or depressed…… ☐

I am extremely anxious or depressed…….. ☐

Part E - Duration and treatment of your back problem

1. In the **last 4 weeks**, which of the following **services** have you used for your back pain? For **each service** you have used, please put a **cross** to show whether this was through the NHS or privately. If you used both NHS *and* private services please cross *both* boxes. For any service that you have not used in the **last 4 weeks** please leave the boxes empty.

	Yes (NHS)	Yes (Private)
Your own doctor / GP..…….	☐	☐
Nurse (at GP surgery or NHS walk-in clinic)..……	☐	☐
Hospital doctor ……..……	☐	☐
Physiotherapist……..	☐	☐
Osteopath……..	☐	☐
Chiropractor……..	☐	☐
Pharmacist……	☐	☐
Massage therapist…….	☐	☐
Other (*please specify)*…….	☐	☐

2. If you have received treatment from any of the above services, please state what this treatment was and how useful it has been.

Treatment (please state up to 3)	Of great help	Of some	Of little help	Of no help
a…….	☐	☐	☐	☐
b…….	☐	☐	☐	☐
c…….	☐	☐	☐	☐

3. Of the treatments you are aware of and if you had a completely free choice, what type of treatment would you prefer to have for your back pain? If you have no preference, please write **none**.

…….

4. In the **last 4 weeks**, which of the following ways have **you** tried to ease your back pain? Please put a *cross* in the box next to each way you have tried in the **last 4 weeks**, leave the box empty if you have not tried this for your back problem.

Prescription medicines (from your doctor)…….. ☐

Medicines you have bought 'over the counter' …….. ☐

Lying down for short periods…….. ☐

Creams or sprays……. ☐

Exercises or stretches…….. ☐

Heat or cold (e.g. hot packs, baths or ice)…….. ☐

Bedrest (lying down most of the time)…… ☐

Massage…….. ☐

Lumbar support / Corset……. ☐

Walking…….. ☐

Swimming ……. ☐

A walking stick…….. ☐

Other (*please specify)*…….. …… ☐

Some people with back pain tell us that they have **distinct bouts / episodes** of back pain, with periods in between when they have no pain. For the next questions we would like you to think about your **most recent bout / episode**.

5. Have you had this current bout / episode of back pain for

Less than 1 month	1 to 3 months	4 to 6 months	7 months to 3 years	More than 3 years
☐	☐	☐	☐	☐

6. How long is it since you had a **whole month without** any back pain?
(You do not need to be exact, please cross the box nearest to your answer)

Less than 1 month	1 to 3 months	4 to 6 months	7 months to 3 years	More than 3 years
☐	☐	☐	☐	☐

7. On a scale where 0 is **painfree** and 10 is **extreme pain,** please put a cross in the box which best describes how you expect your back pain to be 6 months from now.

I expect to be completely painfree — I expect to be in extreme pain

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Part F – The next questions are about activity and exercise.

We are interested in finding out about your levels of activity and exercise. This includes everyday activities such as walking or cleaning windows as well as more formal exercise such as gym work or swimming.

1. Thinking of yourself before this bout / episode of back pain, how would you rate your level of physical activity for your age? *(Please cross one box)*

Very good	Good	Normal	Poor	Very poor
☐	☐	☐	☐	☐

2. How would you rate your level of physical activity during this bout / episode of back pain?
(Please cross one box)

More than usual	Same as usual	Slightly less than usual	Much less than usual
☐	☐	☐	☐

Below is a list of phrases which other patients have used to express how they view their back problem. Please indicate the extent to which **you agree** with each statement by putting a cross in the appropriate box. Please answer **all** the questions. (Think about yourself over the last **2 weeks**.)

		Strongly Disagree	Disagree	Agree	Strongly Agree
3	I'm afraid that I might injure myself if I exercise				
4	If I were to try to overcome it, my pain would increase				
5	My body is telling me I have something dangerously wrong				
6	My pain would probably be relieved if I were to exercise				
7	People aren't taking my medical condition seriously enough				
8	My condition has put my body at risk for the rest of my life				
9	Pain always means I have injured my body				
10	Just because something aggravates my pain does not mean it is dangerous				
11	I am afraid I might injure myself accidentally				
12	Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening				
13	I wouldn't have this much pain if there wasn't something potentially dangerous going on in my body				
14	Although my condition is painful, I would be better off if I were physically active				
15	Pain lets me know when to stop exercising so that I don't injure myself				
16	It's really not safe for a person with a condition like mine to be physically active				
17	I can't do all the things normal people do because it's too easy for me to get injured				
18	Even though something is causing me a lot of pain, I don't think it's actually dangerous				
19	No one should have to exercise when he / she is in pain				

Section 2 – Views about your back problem

Part A

People who are in pain develop many ways of coping with it. Below is a list of common ways of dealing with pain. For **each** sentence, please indicate **how often** you do each of the activities by putting a **cross** through **one** number on each line. There are no right or wrong answers.

For example, 0 means that you **never** engage in the activity; 3 means that you **sometimes** engage in it; 6 means that you **always** do it. But remember you may choose any number you wish from 0-6. (Think about yourself over the last **2 weeks**.)

(Please answer all the sentences on this page)

		Never			Sometimes			Always
1	I try to feel distant from the pain, almost as if the pain was in someone else's body	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2	I try to think of something pleasant	**0**	**1**	**2**	**3**	**4**	**5**	**6**
3	I don't think of it as pain, but rather a dull or warm feeling	**0**	**1**	**2**	**3**	**4**	**5**	**6**
4	It's terrible and I feel it's never going to get any better	**0**	**1**	**2**	**3**	**4**	**5**	**6**
5	It's awful and I feel that it overwhelms me	**0**	**1**	**2**	**3**	**4**	**5**	**6**
6	I feel my life isn't worth living	**0**	**1**	**2**	**3**	**4**	**5**	**6**
7	I try not to think of it as my body, but rather as something separate from me	**0**	**1**	**2**	**3**	**4**	**5**	**6**
8	I tell myself I can't let the pain stand in the way of what I have to do	**0**	**1**	**2**	**3**	**4**	**5**	**6**
9	I pretend it's not there	**0**	**1**	**2**	**3**	**4**	**5**	**6**
10	No matter how bad it gets, I know I can handle it	**0**	**1**	**2**	**3**	**4**	**5**	**6**
11	I worry all the time about whether it will end	**0**	**1**	**2**	**3**	**4**	**5**	**6**
12	I replay in my mind pleasant experiences in the past	**0**	**1**	**2**	**3**	**4**	**5**	**6**
13	I think of people I enjoy doing things with	**0**	**1**	**2**	**3**	**4**	**5**	**6**
14	I imagine that the pain is outside of my body	**0**	**1**	**2**	**3**	**4**	**5**	**6**
15	I just go on as if nothing happened	**0**	**1**	**2**	**3**	**4**	**5**	**6**
16	I see it as a challenge and don't let it bother me	**0**	**1**	**2**	**3**	**4**	**5**	**6**
17	Although it hurts, I just keep on going	**0**	**1**	**2**	**3**	**4**	**5**	**6**
18	I feel I can't stand it anymore	**0**	**1**	**2**	**3**	**4**	**5**	**6**

		Never		Sometimes				Always
19	I feel like I can't go on	**0**	**1**	**2**	**3**	**4**	**5**	**6**
20	I think of things I enjoy doing	**0**	**1**	**2**	**3**	**4**	**5**	**6**
21	I do anything to get my mind off the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
22	I do something I enjoy, such as watching TV or listening to music	**0**	**1**	**2**	**3**	**4**	**5**	**6**
23	I pretend it's not a part of me	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Part B
Listed below are a number of symptoms that you may or may not have experienced since your back problem started. Please indicate **by putting a cross in the box for Yes or No**, to tell us whether you have experienced any of these symptoms **since your back problem started**, and whether you believe that these symptoms are **related to your back problem**.

	I have experienced this symptom since my back problem started				This symptom is related to my back problem			
EXAMPLE								
Pain / ache	**Yes**	☒	**No**	☐	**Yes**	☒	**No**	☐

PLEASE FILL IN BOTH COLUMNS EVEN THOUGH THEY LOOK VERY SIMILAR

		I have experienced this symptom since my back problem started				This symptom is related to my back problem			
1.	Back pain / ache…….	**Yes**	☐	**No**	☐	**Yes**	☐	**No**	☐
2.	Leg pain / ache	**Yes**	☐	**No**	☐	**Yes**	☐	**No**	☐
3.	Anxiety…….	**Yes**	☐	**No**	☐	**Yes**	☐	**No**	☐
4.	Sore Throat……	**Yes**	☐	**No**	☐	**Yes**	☐	**No**	☐
5.	Nausea……	**Yes**	☐	**No**	☐	**Yes**	☐	**No**	☐
6.	Breathlessness……	**Yes**	☐	**No**	☐	**Yes**	☐	**No**	☐

PLEASE FILL IN BOTH COLUMNS EVEN THOUGH THEY LOOK VERY SIMILAR

		I have experienced this symptom since my back problem started		This symptom is related to my back problem	
7.	Weight loss……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
8.	Fatigue……..…	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
9.	Stiff joints…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
10.	Sore eyes ……..	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
11.	Wheeziness……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
12.	Headaches…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
13.	Upset stomach……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
14.	Sleep difficulties……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
15.	Dizziness……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
16.	Loss of strength…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
17.	Unable to sit comfortably……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
18.	Weight gain……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
19.	Pins and needles…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
20.	Fear ……..	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
21.	Numbness……..	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
22.	Locked up / bent double…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐

Part C

We are interested in your **own personal views** of how you now see your **current** back problem. Please indicate how much you agree or disagree with the following statements about your back problem by **putting a cross in one box** on each line.

We realise some of these questions seem quite repetitive and remember there are **no** right or wrong answers. (Think about yourself over the last **2 weeks**.)

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1. My back problem will last a short time					
2. My back problem is likely to be permanent rather than temporary					
3. My back problem will last a long time					
4. This back problem will pass quickly					
5. I expect to have this back problem for the rest of my life					
6. My back problem is a serious condition					
7. My back problem has major consequences on my life					
8. My back problem does not have much effect on my life					
9. My back problem strongly affects the way others see me					
10. My back problem has serious financial consequences					
11. My back problem causes difficulties for those who are close to me					
12. There is a lot I can do to control my symptoms					
13. What I do can determine whether my back problem gets better or worse					
14. The course of my back problem depends on me					
15. Nothing I do will affect my back problem					
16. I have the power to influence my back problem					
17. My actions will have no affect on the outcome of my back problem					
18. My back problem will improve in time					

	Strongly Disagree	Disagree	Neither Agree or Disagre	Agree	Strongly Agree
19. There is very little that can be done to improve my back problem					
20. My treatment will be effective in curing my back problem					
21. The negative effects of my back problem can be prevented (avoided) by my treatment					
22. My treatment can control my back problem					
23. There is nothing which can help my back problem					
24. The symptoms of my back problem are puzzling to me					
25. My back problem is a mystery to me					
26. I don't understand my back problem					
27. My back problem doesn't make any sense to me					
28. I have a clear picture or understanding of my back problem					
29. The symptoms of my back problem change a great deal from day to day					
30. My symptoms come and go in cycles					
31. My back problem is very unpredictable					
32. I go through cycles in which my back problem gets better and worse					
33. I get depressed when I think about my back problem					
34. When I think about my back problem I get upset					
35. My back problem makes me feel angry					
36. My back problem does not worry me					
37. Having this back problem makes me feel anxious					
38. My back problem makes me feel afraid					

Part D

We are **now** interested in what you consider **may have been the cause** of your back problem. As people are very different, there is no correct answer for this question. We are **most** interested in **your own views** about the factors that cause your back problem rather than what others (including doctors or family) may have suggested. Below is a list of possible causes for your back problem. Please indicate how much you agree or disagree that they were causes for your back problem by **putting a cross in one box on each line.**

Possible causes	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1. Stress or worry					
2. Hereditary – it runs in the family					
3. A germ or virus					
4. Diet or eating habits					
5. Chance or bad luck					
6. Poor medical care or treatment in the past					
7. Pollution in the environment					
8. My own behaviour					
9. My mental attitude e.g. thinking about life					
10. Family problems or worries caused my back problem					
11. Overwork					
12. My emotional state e.g. feeling down, lonely, anxious, empty					
13. Ageing					
14. Alcohol					
15. Smoking					
16. Accident or injury					
17. My personality					
18. Altered immunity (change in the body's ability to fight illness)					
19. Tumour (cancer)					
20. Being overweight					
21. Poor workplace design					
22. Inactive lifestyle					

Remember, we are interested in what **you** consider **may have been the cause** of your back problem. Please put a cross in one box on each line.

Possible causes	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
23. Being unfit					
24. Sitting poorly or for too long					
25. Sport/recreational activities or hobbies					
26. My job					
27. Physical activity					
28. Wear and tear in the spine					
29. Lifting or carrying objects					

In the table below, please list the three most important factors that you now believe caused **your back problem**, starting with the **most important** cause **first** and so on. You may use any items from the previous list, or you may have additional ideas of your own.

The most **important causes** of my back problem are:
a.
b.
c.

Part E
Please rate how **confident** you are that you can do the following things **at present**, **despite the pain**. To indicate your answer cross the box of **one** of the numbers on the scale under each item, where **0** = not at all confident and **6** = completely confident.

Remember, these questions are **not** asking whether or not you have been doing these things, but rather **how confident you are that you can do them at present, despite the pain.**

		Not at all confident						Completely confident
1	I can enjoy things, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2	I can do most of the household chores (e.g. tidying-up, washing dishes, etc.), despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
3	I can socialise with my friends or family members as often as I used to do, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
4	I can cope with my pain in most situations	**0**	**1**	**2**	**3**	**4**	**5**	**6**
5	I can do some form of work, despite the pain. ("work" includes housework, paid and unpaid, despite the pain)	**0**	**1**	**2**	**3**	**4**	**5**	**6**
6	I can still do many of the things I enjoy doing, such as hobbies or leisure activity, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
7	I can cope with my pain without medication	**0**	**1**	**2**	**3**	**4**	**5**	**6**
8	I can still accomplish most of my goals in life, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
9	I can live a normal lifestyle, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
10	I can gradually become more active, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Section 3 – General Details

1. What is your current / most recent paid job title? ……

2. Are you currently employed?

Yes …… ☐ Continue with question 3.

No …… ☐ Go to question 7 on the page opposite.

3. How satisfied are you with your employment? *(please cross one box)*

Very satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Very dissatisfied
☐	☐	☐	☐	☐

4. Are you currently…… *(please cross one box)*

Doing your usual job	On reduced or light duties	On paid leave or sick leave	On unpaid leave
☐	☐	☐	☐

5. If you are not doing your usual job, is this because of your back pain?

Yes …… ☐

No …… ☐

6. Can you say how many days you have taken off work during the last 6 months because of your back problem? *(Please cross one box)*

No time off work	Less than 7 days	1-4 weeks	More than 1 month	More than 3 months
☐	☐	☐	☐	☐

7. If you are **not employed**, are you currently…… *(Please cross one box)*

Not working due to back pain	Looking after the home / children	Retired	A student	Not working for another reason
☐	☐	☐	☐	☐

8. What is your date of birth?

Day	Month	Year
☐☐	☐☐	1 9 ☐☐

9. Are you Female ☐ Male ☐

10. Can you tell us your **highest** qualification? For example City and Guilds, GCSE/O-level, Bachelors degree. Write **none** if you have no qualifications

……..

Please let us know any other comments you may have about your back problem or treatment in the space below

Please turn to the next page

Study number:
(office use only)

END OF QUESTIONNAIRE

We may want to contact you again about the possibility of taking a further part in this study. Giving us permission to contact you does not mean you have to take part. Would you be willing to be contacted again? *Please cross one box.*

Yes, I am happy to be contacted again…… ☐

My telephone number is……

No, I do not want to be contacted again……. ☐

Would you be willing to give us permission to review your medical record? This will help us to find out more about the types of treatment you have had. Whether or not you agree will not affect the care you receive from your doctor. We assure you that any information we hold will not include any identifiable information about you (e.g. name, address etc.) and will be held in the strictest confidence. Are you willing to let the researchers look at your medical record? *Please cross one box*

Yes, I give permission for my medical record to be reviewed…… ☐

No, I do not want my medical records reviewed…… ☐

Your signature:

	Day	Month	Year
Today's date	☐☐	☐☐	2 0 0 ☐

Please print your name and address ……..

……..

……..

……..

Thank you for taking the time to fill in this questionnaire, your answers will be very useful to us. Now please put the questionnaire in the envelope provided and send it back to us. You do **not** need to put a stamp on the envelope. If you have any further questions about this questionnaire or the study in general, you can telephone **Annette Bishop on 01782 583921** during office hours.

Thank you very much for your help with this important research study

(date 07/10/2004)

Study number:
(office use only)

KEELE
UNIVERSITY

BeBack

Beliefs about Backpain Study

12 month follow up

Please complete this questionnaire even if you no longer have a back problem.

- When completing this questionnaire, please try to be as accurate and honest as you can throughout. There are no 'correct' or 'incorrect' answers. Answer according to your own feelings, rather than how you think most people will answer. Try not to let your answer to one question influence your answers to other questions.
- Please return this questionnaire in the envelope provided. **You do not need a stamp.**
- If you have any further questions about this questionnaire or the study in general, you can telephone Annette Bishop on 01782 583921 during office hours.

Thank you for your help with this important research study

INSTRUCTIONS FOR THIS QUESTIONNAIRE

Please answer **all** of the questions, even if you feel that they do not apply to you. Some of the questions are arranged in sections according to the period of time that they ask about. Some questions may look like others, but each one **is different.** Some of the questions are about you and some are about your back pain or how you feel about your back pain. Please take the time to read and answer each question carefully.

Please fill in sections 1, 2 and 3 of this questionnaire, as best you can, **even if you no longer have back pain**. Fill in all sections (1, 2, 3 and 4) if you still have your back problem.

Most of the questions can be answered by putting a **cross** in a box next to or under your answer. For example, if you wish to answer 'Not at all', **cross** the box like this:

Not at all	Slightly	Moderately	Very much	Extremely
☒	☐	☐	☐	☐

Here is an example of how to answer a question if you **don't** have any pain:

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10
☒	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Now please continue and fill in this questionnaire.

Section 1 – Your back problem

Part A - For this first set of questions, please think about your back pain in the last 6 months.

1. In the **last 6 months**, how intense was your **worst** back pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

2. In the **last 6 months**, on **average**, how intense was your back pain rated on a 0-10 scale, where 0 is 'no pain' and 10 is 'pain as bad as could be'? (That is, your usual pain at times you were experiencing pain.) *(Please cross one box)*

No pain — Pain as bad as could be

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

3. About how many **days** in total in the **last 6 months** have you been kept from your **usual activities** (work, study or housework) because of your back pain? *(Please cross one box)*

0 days	☐	15-30 days	☐
1-6 days	☐	31 days to 3 months	☐
7-14 days	☐	More than 3 months	☐

4. In the **last 6 months**, how much has your back pain **interfered** with your **daily activities** rated on a 0-10 scale where 0 is 'no interference' and 10 is 'unable to carry on any activities'? *(Please cross one box)*

No interference — Unable to carry on any activities

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

5. In the **last 6 months**, how much has your back pain **changed** your ability to take part in recreational, social and family activities where 0 is 'no change' and 10 is 'extreme change'? *(Please cross one box)*

No change — Extreme change

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Remember, these questions are about the **last 6 months**

6. In the **last 6 months**, how much has your back pain **changed** your ability to **work** (including housework) where 0 is 'no change' and 10 is 'extreme change'? *(Please cross one box)*

No change										Extreme change
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Part B – For the next set of questions, please think about the last 2 weeks

1. Has the pain from your back spread down one or both of your legs at any time in the **last 2 weeks**? *(Please cross one box)*

Yes ☐ No ☐

If yes; have you felt pain or numbness or pins and needles **below** your knee in the **last 2 weeks**? *(Please cross one box)*

Yes ☐ No ☐

2. Have you had pain in any of the following areas of your body in the **last 2 weeks**? *(Cross the box under all that apply)*

Shoulder	Arm	Neck	Head	None
☐	☐	☐	☐	☐

3. In the **last 2 weeks**, how intense was your **most** painful back pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

4. In the **last 2 weeks**, how intense was your **least** painful back pain rated on a 0-10 scale where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Remember to think about the last **2 weeks**

5. In the **last 2 weeks**, on **average**, how intense was your **usual** back pain rated on a 0-10 scale, where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(Please cross one box)*

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

6. If you have had pain in the last **two weeks**, how **bothersome** has your back pain been? *(Please cross one box)*

Not at all	Slightly	Moderately	Very much	Extremely
☐	☐	☐	☐	☐

Part C – For the next set of questions, please think about the <u>last week</u>

For the next questions, please read each item and **cross the box** of the reply that comes closest to how you have been feeling in the **last week.** Don't take too long over your replies; your immediate reaction to each item will usually be more accurate than a long thought out response.

1. I feel tense or wound up: *(Please cross one box)*

Most of the time	A lot of the time	From time to time, occasionally	Not at all
☐	☐	☐	☐

2. I still enjoy the things I used to enjoy: *(Please cross one box)*

Definitely as much	Not quite as much	Only a little	Hardly at all
☐	☐	☐	☐

Remember to think about the last **week**

3. I get a sort of frightened feeling as if something awful is about to happen:
(Please cross one box)

Very definitely and quite badly	Yes, but not too badly	A little, but it doesn't worry me	Not at all
☐	☐	☐	☐

4. I can laugh and see the funny side of things: *(Please cross one box)*

As much as I always could	Not quite so much now	Definitely not so much now	Not at all
☐	☐	☐	☐

5. Worrying thoughts go through my mind: *(Please cross one box)*

A great deal of the time	A lot of the time	From time to time, but not too often	Only occasionally
☐	☐	☐	☐

6. I feel cheerful: *(Please cross one box)*

Not at all	Not often	Sometimes	Most of the time
☐	☐	☐	☐

7. I can sit at ease and feel relaxed: *(Please cross one box)*

Definitely	Usually	Not often	Not at all
☐	☐	☐	☐

8. I feel as if I am slowed down: *(Please cross one box)*

Nearly all of the time	Very often	Sometimes	Not at all
☐	☐	☐	☐

Remember to think about the last **week**

9. I get a sort of frightened feeling like butterflies in my stomach: *(Please cross one box)*

Not at all	Occasionally	Quite often	Very often
☐	☐	☐	☐

10. I have lost interest in my appearance: *(Please cross one box)*

Definitely	I don't take as much care as I should	I may not take quite as much care	Hardly at all
☐	☐	☐	☐

11. I feel restless as if I have to be on the move: *(Please cross one box)*

Very much indeed	Quite a lot	Not very much	Not at all
☐	☐	☐	☐

12. I look forward with enjoyment to things: *(Please cross one box)*

As much as I ever did	Rather less than I used to	Definitely less than I used to	Hardly at all
☐	☐	☐	☐

13. I get sudden feelings of panic: *(Please cross one box)*

Very often indeed	Quite often	Not very often	Not at all
☐	☐	☐	☐

14. I can enjoy a good book or radio or TV programme: *(Please cross one box)*

Often	Sometimes	Not often	Very seldom
☐	☐	☐	☐

Part D - The next set of questions are about you <u>today</u>

When your back hurts, you may find it difficult to do some of the things you normally do.
This list contains sentences that people have used to describe themselves when they have back pain. When you read them, you may find that some stand out because they describe you **today**. As you read the list, think of yourself **today**.
When you read a sentence that describes you **today**, put a **cross** in the box next to it. If the sentence does not describe you today, then leave the box **empty** and go on to the next sentence. Remember, only cross the box next to the sentence if you are sure that it describes you **today**.

1. I stay at home most of the time because of my back…… ☐

2. I change position frequently to try and get my back comfortable…… ☐

3. I walk more slowly than usual because of my back……. ☐

4. Because of my back I am not doing any of the jobs that I usually do around the house……. ☐

5. Because of my back, I use a handrail to get upstairs…… ☐

6. Because of my back, I lie down to rest more often…….……. ☐

7. Because of my back, I have to hold on to something to get out of an easy chair… ☐

8. Because of my back, I try to get other people to do things for me…….. ☐

9. I get dressed more slowly than usual because of my back…….. ☐

10. I only stand for short periods of time because of my back…….. ☐

11. Because of my back, I try not to bend or kneel down……. ☐

12. I find it difficult to get out of a chair because of my back…….……. ☐

13. My back is painful almost all the time…… ☐

14. I find it difficult to turn over in bed because of my back…… ☐

15. My appetite is not very good because of my back pain…….……. ☐

16. I have trouble putting on my socks (or tights) because of the pain in my back….. ☐

17. I only walk short distances because of my back pain…….. ☐

18. I sleep less well because of my back…… ☐

☐

Remember to think about **today**

20. I sit down for most of the day because of my back……..…… ☐

21. I avoid heavy jobs around the house because of my back…… ☐

22. Because of my back pain, I am more irritable and bad tempered with people than usual……. ☐

23. Because of my back, I go upstairs more slowly than usual……. ☐

24. I stay in bed most of the time because of my back…….. ☐

25. How would you rate your back pain on a 0-10 scale **at the present time,** that is right now, where 0 is 'no pain' and 10 is 'pain as bad as could be'? *(please cross one box)*

No pain										Pain as bad as could be
0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Remember to think about today

By placing a cross in each group below, please indicate which statement best describes your own health state **today**. Do not cross more than one box in each group

26. Mobility

I have no problems in walking about……. ☐

I have some problems in walking about……. ☐

I am confined to bed…….. ☐

27. Self-care

I have no problems with self-care…….. ☐

I have some problems washing or dressing myself…… ☐

I am unable to wash or dress myself…….. ☐

28. Usual activities (e.g. work, study, housework, family or leisure activities)

I have no problems with performing my usual activities…….. ☐

I have some problems with performing my usual activities…….. ☐

I am unable to perform my usual activities…… ☐

Remember to think about **today** and do not cross more than one box in each group of questions 29 and 30.

29. Pain / discomfort

I have no pain or discomfort…….. ☐

I have moderate pain or discomfort…… ☐

I have extreme pain or discomfort…….. ☐

30. Anxiety / depression

I am not anxious or depressed…… ☐

I am moderately anxious or depressed…… ☐

I am extremely anxious or depressed…….. ☐

Part E - Duration and treatment of your back problem

1. During the **past 12 months**, have you attended hospital because of your **back pain**, as an out-patient, an in-patient or a day case patient? *Please cross one box.*

Yes ☐ No ☐

If Yes: please list the procedures in the table below and then cross a box to indicate whether this was carried out at a NHS or a private hospital.
If No: continue with question 2.

Please describe each procedure (e.g. injection, discectomy, MRI scan, x-ray, CT scan, surgery to low back etc.)	NHS hospital	Private hospital
a…….	☐	☐
b…….	☐	☐
c……	☐	☐
d……	☐	☐
e……	☐	☐

2. Since you completed the first BeBack questionnaire approximately **12 months ago**, which of the following **services** have you used for your back pain? For each service you have used, please put a cross to show whether this was through the NHS or privately. If you used both NHS *and* private services please cross *both* boxes. For any service that you have not used since the first BeBack questionnaire please leave the boxes empty. Please indicate **how many times** you have visited each of these services by writing a number in the right hand box.

	Yes (NHS)	Yes (Private)	Number of times visited
Your own doctor / GP..……	☐	☐	☐
Nurse (at GP surgery or NHS walk-in clinic)..…	☐	☐	☐
Physiotherapist……	☐	☐	☐
Osteopath……	☐	☐	☐
Chiropractor……	☐	☐	☐
Pharmacist……..	☐	☐	☐
Massage therapist……	☐	☐	☐
Acupuncturist…….	☐	☐	☐
Other (*please specify)*……	☐	☐	☐

3. If you have received **treatment** from any of these services, please state what this treatment was and how useful it has been.

Treatment (please state up to 3)	Of great help	Of some	Of little help	Of no help
a…….	☐	☐	☐	☐
b…….	☐	☐	☐	☐
c…….	☐	☐	☐	☐

4. Of the treatments you are aware of and if you had a completely free choice, what type of treatment would you prefer to have for your current back problem, or if you were to have a future back problem? If you have no preference, please write **none**.

……

5. Since you completed the first BeBack questionnaire approximately **12 months ago**, which of the following ways have **you** tried to ease your back pain? Please put a *cross* in the box next to each way you have tried, leave the box empty if you have not tried this for your back problem.

Prescription medicines (from your doctor)…….. ☐

Medicines you have bought 'over the counter' …….. ☐

Lying down for short periods…….. ☐

Creams or sprays……. ☐

Exercises or stretches…….. ☐

Heat or cold (e.g. hot packs, baths or ice)…….. ☐

Bedrest (lying down most of the time)…… ☐

Massage…….. ☐

Lumbar support / Corset……. ☐

Walking…….. ☐

Swimming ……. ☐

A walking stick…….. ☐

Other (*please specify).*…… ☐

6. Compared to when you completed your first BeBack questionnaire, approximately **12 months ago**, how would you say your back problem is **now**? *(Please cross one box)*

Completely recovered	Much improved	Improved	No change	Worse	Much worse
☐	☐	☐	☐	☐	☐

7. On a scale where 0 is **painfree** and 10 is **extreme pain**, please put a cross in the box which best describes how you expect your back pain to be 6 months from now. *(Please cross one box)*

I expect to be completely painfree — I expect to be in extreme pain

0	1	2	3	4	5	6	7	8	9	10
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

Section 2 – Views about your back problem
Please try and complete this section as best you can even if you no longer have your back problem

Part A - Listed below are a number of symptoms that you may or may not have experienced since your back problem started. Please indicate **by putting a cross in the box for Yes or No,** to tell us whether you have experienced any of these symptoms **since your back problem** started, and whether you believe that these symptoms are **related to** your back problem.

	I have experienced this symptom since my back problem started		This symptom is related to my back problem	
EXAMPLE				
Pain / ache	**Yes** ☒	**No** ☐	**Yes** ☒	**No** ☐

PLEASE FILL IN BOTH COLUMNS EVEN THOUGH THEY LOOK VERY SIMILAR

		I have experienced this symptom since my back problem started		This symptom is related to my back problem	
1.	Back pain / ache…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
2.	Leg pain / ache	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
3.	Anxiety…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
4.	Sore Throat……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
5.	Nausea……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
6.	Breathlessness……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
7.	Weight loss……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
8.	Fatigue……..…	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
9.	Stiff joints…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
10.	Sore eyes ……..	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
11.	Wheeziness……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
12.	Headaches…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
13.	Upset stomach……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐

PLEASE FILL IN BOTH COLUMNS EVEN THOUGH THEY LOOK VERY SIMILAR

		I have experienced this symptom since my back problem started		This symptom is related to my back problem	
14.	Sleep difficulties……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
15.	Dizziness……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
16.	Loss of strength…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
17.	Unable to sit comfortably……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
18.	Weight gain……	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
19.	Pins and needles…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
20.	Fear ……..	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
21.	Numbness……..	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐
22.	Locked up / bent double…….	**Yes** ☐	**No** ☐	**Yes** ☐	**No** ☐

Part B –We are interested in your **own personal views** of how you now see your back problem. Please indicate how much you agree or disagree with the following statements about your back problem by **putting a cross in one box** on each line. Think about your current back problem, or if you do not have a back problem at the moment, the back problem you had approximately 6 months ago.
We realise some of these questions seem quite repetitive and remember there are **no** right or wrong answers.

		Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1.	My back problem will last a short time					
2.	My back problem is likely to be permanent rather than temporary					
3.	My back problem will last a long time					
4.	This back problem will pass quickly					
5.	I expect to have this back problem for the rest of my life					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
6. My back problem is a serious condition					
7. My back problem has major consequences on my life					
8. My back problem does not have much effect on my life					
9. My back problem strongly affects the way others see me					
10. My back problem has serious financial consequences					
11. My back problem causes difficulties for those who are close to me					
12. There is a lot I can do to control my symptoms					
13. What I do can determine whether my back problem gets better or worse					
14. The course of my back problem depends on me					
15. Nothing I do will affect my back problem					
16. I have the power to influence my back problem					
17. My actions will have no affect on the outcome of my back problem					
18. My back problem will improve in time					
19. There is very little that can be done to improve my back problem					
20. My treatment will be effective in curing my back problem					
21. The negative effects of my back problem can be prevented (avoided) by my treatment					
22. My treatment can control my back problem					
23. There is nothing which can help my back problem					
24. The symptoms of my back problem are puzzling to me					
25. My back problem is a mystery to me					
26. I don't understand my back problem					
27. My back problem doesn't make any sense to me					

	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
28. I have a clear picture or understanding of my back problem					
29. The symptoms of my back problem change a great deal from day to day					
30. My symptoms come and go in cycles					
31. My back problem is very unpredictable					
32. I go through cycles in which my back problem gets better and worse					
33. I get depressed when I think about my back problem					
34. When I think about my back problem I get upset					
35. My back problem makes me feel angry					
36. My back problem does not worry me					
37. Having this back problem makes me feel anxious					
38. My back problem makes me feel afraid					

Part C - We are **now** interested in what you consider **may have been the cause** of your back problem. As people are very different, there is no correct answer for this question. We are **most** interested in **your own views** about the factors that cause your back problem rather than what others (including doctors or family) may have suggested. Below is a list of possible causes for your back problem. Please indicate how much you agree or disagree that they were causes for your back problem by **putting a cross in one box on each line**

Possible causes	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
1. Stress or worry					
2. Hereditary – it runs in the family					
3. A germ or virus					
4. Diet or eating habits					
5. Chance or bad luck					
6. Poor medical care or treatment in the past					
7. Pollution in the environment					

Possible causes	Strongly Disagree	Disagree	Neither Agree or Disagree	Agree	Strongly Agree
8. My own behaviour					
9. My mental attitude e.g. thinking about life					
10. Family problems or worries caused my back problem					
11. Overwork					
12. My emotional state e.g. feeling down, lonely, anxious, empty					
13. Ageing					
14. Alcohol					
15. Smoking					
16. Accident or injury					
17. My personality					
18. Altered immunity (change in the body's ability to fight illness)					
19. Tumour (cancer)					
20. Being overweight					
21. Poor workplace design					
22. Inactive lifestyle					
23. Being unfit					
24. Sitting poorly or for too long					
25. Sport/recreational activities or hobbies					
26. My job					
27. Physical activity					
28. Wear and tear in the spine					
29. Lifting or carrying objects					

In the table below, please list the three most important factors that you now believe caused **your back problem**, starting with the **most important** cause **first** and so on. You may use any items from the previous list, or you may have additional ideas of your own.

The most **important causes** of my back problem are:
a.
b.
c.

Section 3 – General Details

1. Are you currently employed?

Yes …… ☐ Continue with question 2.

No …… ☐ Go to question 6 below.

2. How satisfied are you with your employment? *(please cross one box)*

Very satisfied	Satisfied	Neither satisfied or dissatisfied	Dissatisfied	Very dissatisfied
☐	☐	☐	☐	☐

3. Are you currently…… *(please cross one box)*

Doing your usual job	On reduced or light duties	On paid leave or sick leave	On unpaid leave
☐	☐	☐	☐

4. If you are not doing your usual job, is this because of your back pain?

Yes …… ☐

No …… ☐

5. Can you say how many days you have taken off work during the last 6 months because of your back problem? *(Please cross one box)*

No time off work	Less than 7 days	1-4 weeks	More than 1 month	More than 3 months
☐	☐	☐	☐	☐

6. If you are **not employed**, are you currently…….. *(Please cross one box)*

Not working due to back pain	Looking after the home / children	Retired	A student	Not working for another reason
☐	☐	☐	☐	☐

7. What is your date of birth?

	Day	Month	Year
	☐☐	☐☐	1 9 ☐☐

8. Are you Female ☐ Male ☐

**** If you have not had your back problem in the last 2 weeks,** please miss out section 4 below. Add any comments you may have in the box on page 21 and return the questionnaire in the envelope provided. **If you still have your back problem, please complete section 4 below****

Section 4 – if you still have a back problem

Part A – **Some** people with back pain tell us that they have **distinct bouts / episodes** of back pain, with periods in between when they have no pain. For the next questions we would like you to think about your **most recent bout / episode**.

1. Have you had this current bout / episode of back pain for,

I do not have any pain	Less than 1 month	1 to 3 months	4 to 6 months	7 months to 3 years	More than 3 years
☐	☐	☐	☐	☐	☐

2. How long is it since you had a **whole month without** any back pain?
(You do not need to be exact, please cross the box nearest to your answer)

Less than 1 month	1 to 3 months	4 to 6 months	7 months to 3 years	More than 3 years
☐	☐	☐	☐	☐

Part B – Below is a list of phrases which other patients have used to express how they view their back problem. Please indicate the extent to which **you agree** with each statement by putting a cross in the appropriate box. Please answer **all** the questions. (Think about yourself over the last **2 weeks**.)

		Strongly Disagree	Disagree	Agree	Strongly Agree
1	I'm afraid that I might injure myself if I exercise				
2	If I were to try to overcome it, my pain would increase				
3	My body is telling me I have something dangerously wrong				
4	My pain would probably be relieved if I were to exercise				
5	People aren't taking my medical condition seriously enough				
6	My condition has put my body at risk for the rest of my life				
7	Pain always means I have injured my body				
8	Just because something aggravates my pain does not mean it is dangerous				

		Strongly Disagree	Disagree	Agree	Strongly Agree
9	I am afraid I might injure myself accidentally				
10	Simply being careful that I do not make any unnecessary movements is the safest thing I can do to prevent my pain from worsening				
11	I wouldn't have this much pain if there wasn't something potentially dangerous going on in my body				
12	Although my condition is painful, I would be better off if I were physically active				
13	Pain lets me know when to stop exercising so that I don't injure myself				
14	It's really not safe for a person with a condition like mine to be physically active				
15	I can't do all the things normal people do because it's too easy for me to get injured				
16	Even though something is causing me a lot of pain, I don't think it's actually dangerous				
17	No one should have to exercise when he/she is in pain				

Part C - People who are in pain develop many ways of coping with it. Below is a list of common ways of dealing with pain. For **each** sentence, please indicate **how often** you do each of the activities by putting a **cross** through **one** number on each line. There are no right or wrong answers.

For example, 0 means that you **never** engage in the activity; 3 means that you **sometimes** engage in it; 6 means that you **always** do it. But remember you may choose any number you wish from 0-6. (Think about yourself over the last **2 weeks**.)

		Never			Sometimes			Always
1	I try to feel distant from the pain, almost as if the pain was in someone else's body	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2	I try to think of something pleasant	**0**	**1**	**2**	**3**	**4**	**5**	**6**
3	I don't think of it as pain, but rather a dull or warm feeling	**0**	**1**	**2**	**3**	**4**	**5**	**6**
4	It's terrible and I feel it's never going to get any better	**0**	**1**	**2**	**3**	**4**	**5**	**6**
5	It's awful and I feel that it overwhelms me	**0**	**1**	**2**	**3**	**4**	**5**	**6**
6	I feel my life isn't worth living	**0**	**1**	**2**	**3**	**4**	**5**	**6**

		Never			Sometimes			Always
7	I try not to think of it as my body, but rather as something separate from me	**0**	**1**	**2**	**3**	**4**	**5**	**6**
8	I tell myself I can't let the pain stand in the way of what I have to do	**0**	**1**	**2**	**3**	**4**	**5**	**6**
9	I pretend it's not there	**0**	**1**	**2**	**3**	**4**	**5**	**6**
10	No matter how bad it gets, I know I can handle it	**0**	**1**	**2**	**3**	**4**	**5**	**6**
11	I worry all the time about whether it will end	**0**	**1**	**2**	**3**	**4**	**5**	**6**
12	I replay in my mind pleasant experiences in the past	**0**	**1**	**2**	**3**	**4**	**5**	**6**
13	I think of people I enjoy doing things with	**0**	**1**	**2**	**3**	**4**	**5**	**6**
14	I imagine that the pain is outside of my body	**0**	**1**	**2**	**3**	**4**	**5**	**6**
15	I just go on as if nothing happened	**0**	**1**	**2**	**3**	**4**	**5**	**6**
16	I see it as a challenge and don't let it bother me	**0**	**1**	**2**	**3**	**4**	**5**	**6**
17	Although it hurts, I just keep on going	**0**	**1**	**2**	**3**	**4**	**5**	**6**
18	I feel I can't stand it anymore	**0**	**1**	**2**	**3**	**4**	**5**	**6**
19	I feel like I can't go on	**0**	**1**	**2**	**3**	**4**	**5**	**6**
20	I think of things I enjoy doing	**0**	**1**	**2**	**3**	**4**	**5**	**6**
21	I do anything to get my mind off the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
22	I do something I enjoy, such as watching TV or listening to music	**0**	**1**	**2**	**3**	**4**	**5**	**6**
23	I pretend it's not a part of me	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Part D - Please rate how **confident** you are that you can do the following things **at present**, **despite the pain**. To indicate your answer cross the box of **one** of the numbers on the scale under each item, where **0** = not at all confident and **6** = completely confident.

Remember, these questions are **not** asking whether or not you have been doing these things, but rather **how confident you are that you can do them at present, despite the pain.**

		Not at all confident						Completely confident
1	I can enjoy things, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
2	I can do most of the household chores (e.g. tidying-up, washing dishes, etc.), despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
3	I can socialise with my friends or family members as often as I used to do, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
4	I can cope with my pain in most situations	**0**	**1**	**2**	**3**	**4**	**5**	**6**
5	I can do some form of work, despite the pain. ("work" includes housework, paid and unpaid, despite the pain)	**0**	**1**	**2**	**3**	**4**	**5**	**6**

		Not at all confident						Completely confident
6	I can still do many of the things I enjoy doing, such as hobbies or leisure activity, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
7	I can cope with my pain without medication	**0**	**1**	**2**	**3**	**4**	**5**	**6**
8	I can still accomplish most of my goals in life, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
9	I can live a normal lifestyle, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**
10	I can gradually become more active, despite the pain	**0**	**1**	**2**	**3**	**4**	**5**	**6**

Please let us know any other comments you may have about your back problem or treatment in the space below

If you have changed your telephone number since completing the last BeBack questionnaire 6 months ago, please can you write your new telephone number here.

……

Thank you for taking the time to fill in this questionnaire, your answers will be very useful to us. Now please put the questionnaire in the envelope provided and send it back to us. You do **not** need to put a stamp on the envelope. If you have any further questions about this questionnaire or the study in general, you can telephone **Annette Bishop on 01782 583921** during office hours.

Thank you for your help with this important research project

Study number:
(office use only)

(Version 1: 08.07.05)

Appendix 2: Coping measures

(i) Vanderbilt Pain Management Inventory

FACTOR LOADINGS FOR ACTIVE COPING (AC) AND PASSIVE COPING (PC) ITEMS DERIVED FROM EXPLORATORY AND CONFIRMATORY FACTOR ANALYSES

All confirmatory factor analysis (CFA) loadings were significant as indicated by t values ($P < 0.05$). CFA loadings of zero were fixed a priori.

Item content	Exploratory		Confirmatory	
	PC	AC	PC	AC
Wishing doctor would prescribe better pain medication	0.55	−0.16	0.46	0.0
Thinking the pain is wearing one down	0.68	−0.16	0.50	0.0
Telling others how much the pain hurts	0.54	−0.10	0.50	0.0
Praying for relief	0.42	0.14	0.30	0.0
Restricting social activities	0.66	−0.01	0.41	0.0
Depending on others for help with daily tasks	0.43	−0.07	0.40	0.0
Thinking one cannot do anything to cope with the pain	0.56	−0.19	0.48	0.0
Taking medication for purposes of immediate pain relief	0.41	−0.03	0.59	0.0
Calling a doctor or nurse	0.51	0.05	0.58	0.0
Focusing on the location and intensity of the pain	0.58	−0.15	0.69	0.0
Suppressing angry, depressed or frustrated feelings	0.34	−0.06	0.29	0.0
Lying down to rest *	0.41	0.07		
Avoiding activities or movements which make the pain worse *	0.35	0.08		
Taking a hot bath or using rubbing ointments *	0.44	0.27		
Wondering whether one has done anything to cause or exacerbate the pain *	0.39	0.23		
Watching television *	0.16	0.05		
Engaging in physical exercise or physical therapy	−0.03	0.42	0.0	0.46
Ignoring the pain	−0.17	0.37	0.0	0.32
Staying busy or active	−0.23	0.45	0.0	0.56
Clearing mind of bothersome thoughts	0.14	0.46	0.0	0.40
Reading	−0.06	0.47	0.0	0.47
Participating in leisure activities	−0.03	0.48	0.0	0.59
Distracting attention from the pain	0.05	0.69	0.0	0.62
Thinking one can handle the pain by oneself *	0.04	0.33		
Relaxing the muscles *	0.27	0.36		
Imagining pleasant situations *	0.38	0.31		
Expressing angry, depressed or frustrated feelings *	0.34	0.24		

* Items dropped from the scales because they did not reach specified criteria.

Appendix 2: Coping measures

(ii) Chronic Pain Coping Inventory

CPCI: patient version

During the past week, how many days did you use each of the following at least once in the day to cope with your pain? (Note: You may have used some of these coping strategies on days that you did not have pain to prevent or minimize pain in the future. Please indicate the number of days you used each strategy FOR PAIN, whether or not you were experiencing pain at the time).

		Number of days
1.	Imagined a calming or distracting image to help me relax	0 1 2 3 4 5 6 7
2.	Kept on doing what I was doing	0 1 2 3 4 5 6 7
3.	Stretched the muscles in my legs and held the stretch for at least 10 seconds	0 1 2 3 4 5 6 7
4.	Ignored the pain	0 1 2 3 4 5 6 7
5.	I took a rest	0 1 2 3 4 5 6 7
6.	Made arrangements to see a friend or family member	0 1 2 3 4 5 6 7
7.	I went to bed early to rest	0 1 2 3 4 5 6 7
8.	I got support from a friend	0 1 2 3 4 5 6 7
9.	Asked someone to do something for me	0 1 2 3 4 5 6 7
10.	Reminded myself that things could be worse	0 1 2 3 4 5 6 7
11.	Avoided using part of my body (e.g., hand, arm, leg)	0 1 2 3 4 5 6 7
12.	Focussed on relaxing my muscles	0 1 2 3 4 5 6 7
13.	Sat on the floor, stretched, and held the stretch at least 10 seconds	0 1 2 3 4 5 6 7
14.	Told myself things will get better	0 1 2 3 4 5 6 7
15.	Held on to something when getting up or sitting down	0 1 2 3 4 5 6 7
16.	I got support from a family member	0 1 2 3 4 5 6 7
17.	Exercised to strengthen the muscles in my arms for at least 1 minute	0 1 2 3 4 5 6 7
18.	I rested as much as I could	0 1 2 3 4 5 6 7
19.	Thought about someone with problems worse than mine	0 1 2 3 4 5 6 7
20.	I talked to someone close to me	0 1 2 3 4 5 6 7
21.	Told myself that I am adjusting to my pain problem better than many other people	0 1 2 3 4 5 6 7
22.	Called a friend on the phone to help me feel better	0 1 2 3 4 5 6 7
23.	Thought about all the good things I have	0 1 2 3 4 5 6 7
24.	Listened to music to relax	0 1 2 3 4 5 6 7
25.	Asked for help with a chore or task	0 1 2 3 4 5 6 7
26.	Stretched the muscles in my neck (and held the stretch) for at least 10 seconds	0 1 2 3 4 5 6 7
27.	Told myself my pain will get better	0 1 2 3 4 5 6 7
28.	I didn't let the pain interfere with my activities	0 1 2 3 4 5 6 7
29.	Exercised to strengthen the muscles in my legs for at least 1 minute	0 1 2 3 4 5 6 7
30.	Thought about a friend who has coped well with a problem	0 1 2 3 4 5 6 7
31.	Listened to a relaxation tape to relax	0 1 2 3 4 5 6 7
32.	Engaged in aerobic exercise (exercise that made my heart beat faster) for at least 15 minutes	0 1 2 3 4 5 6 7
33.	Limited my walking because of pain	0 1 2 3 4 5 6 7
34.	Just didn't pay attention to the pain	0 1 2 3 4 5 6 7
35.	Walked with a limp to decrease the pain	0 1 2 3 4 5 6 7
36.	Meditated to relax	0 1 2 3 4 5 6 7
37.	Reminded myself that I had coped with the pain before	0 1 2 3 4 5 6 7
38.	Lay on my back, stretched, and held the stretch at least 10 seconds	0 1 2 3 4 5 6 7
39.	Held part of my body (e.g., arm) in a special position	0 1 2 3 4 5 6 7
40.	Rested in a chair or recliner	0 1 2 3 4 5 6 7
41.	Avoided putting weight on feet or legs	0 1 2 3 4 5 6 7
42.	Asked for help in carrying, lifting or pushing something	0 1 2 3 4 5 6 7
43.	Exercised to improve my overall physical condition for at least 5 minutes	0 1 2 3 4 5 6 7
44.	Talked to a friend or family member for support	0 1 2 3 4 5 6 7
45.	Reminded myself that there are people who are worse off than I am	0 1 2 3 4 5 6 7
46.	Limited my standing time	0 1 2 3 4 5 6 7
47.	Lay down on a bed	0 1 2 3 4 5 6 7
48.	Avoided some physical activities (lifting, pushing, carrying)	0 1 2 3 4 5 6 7
49.	Reminded myself about things that I have going for me such as intelligence, good looks, and good friends	0 1 2 3 4 5 6 7
50.	Used self-hypnosis to relax	0 1 2 3 4 5 6 7
51.	I just kept going	0 1 2 3 4 5 6 7
52.	Exercised to strengthen the muscles in my stomach for at least 1 minute	0 1 2 3 4 5 6 7
53.	Got together with a friend	0 1 2 3 4 5 6 7
54.	Reminded myself that others have coped well with pain problems	0 1 2 3 4 5 6 7
55.	Stretched the muscles where I hurt and held the stretch for at least 10 seconds	0 1 2 3 4 5 6 7
56.	Avoided activity	0 1 2 3 4 5 6 7

	Number of days
57. Got together with a family member	0 1 2 3 4 5 6 7
58. Went into a room by myself to rest	0 1 2 3 4 5 6 7
59. Used deep, slow breathing to relax	0 1 2 3 4 5 6 7
60. Exercised to strengthen the muscles in my back for at least 1 minute	0 1 2 3 4 5 6 7
61. Stretched the muscles in my shoulders or arms, and held the stretch, for at least 10 seconds	0 1 2 3 4 5 6 7
62. Asked someone to get me something (e.g., medicine, food, drink)	0 1 2 3 4 5 6 7
63. Did not let the pain affect what I was doing	0 1 2 3 4 5 6 7
64. Lay down on a sofa	
65. Please list each medication you took for pain during the past week, and indicate the number of days you took each medication during the past week. Some common medications taken for pain are: Aspirin, Tylenol®, Advil®, Nuprin®, Naprosyn®, Percodan®, Tylenol #3®, Valium®, Soma®, Fiorinal®, and Flexeril®. However, there are many others, so please list ALL of the medications you are taking for pain, not just the ones listed above.	

	Number of days
.....	0 1 2 3 4 5 6 7
.....	0 1 2 3 4 5 6 7
.....	0 1 2 3 4 5 6 7
.....	0 1 2 3 4 5 6 7
.....	0 1 2 3 4 5 6 7
.....	

Please place a check mark here if you do not take any medications for pain ☐

CPCI: significant-other version

During the past week, how many days did your significant other (SO) use each of the following at least once in the day to cope with his or her pain? If you were unable to observe your SO enough to be able to accurately rate the number of days he or she used a coping strategy, please indicate this by circling 'UO' ('unable to observe') for that strategy.

	Number of days	Unable to observe
1. Kept on doing what he or she was doing	0 1 2 3 4 5 6 7	UO
2. Stretched the muscles in his or her legs and held the stretch for at least 10 sec	0 1 2 3 4 5 6 7	UO
3. Took a rest	0 1 2 3 4 5 6 7	UO
4. Made arrangements to see a friend or family member	0 1 2 3 4 5 6 7	UO
5. Went to bed early to rest	0 1 2 3 4 5 6 7	UO
6. Got support from a friend	0 1 2 3 4 5 6 7	UO
7. Asked someone to do something for him or her	0 1 2 3 4 5 6 7	UO
8. Avoided using part of his or her body (e.g., hand, arm, leg)	0 1 2 3 4 5 6 7	UO
9. Sat on the floor, stretched, and held the stretch at least 10 sec	0 1 2 3 4 5 6 7	UO
10. Held on to something when getting up or sitting down	0 1 2 3 4 5 6 7	UO
11. Got support from a family member	0 1 2 3 4 5 6 7	UO
12. Exercised to strengthen the muscles in his or her arms for at least 1 min	0 1 2 3 4 5 6 7	UO
13. Rested as much as he or she could	0 1 2 3 4 5 6 7	UO
14. Talked to someone close to him or her	0 1 2 3 4 5 6 7	UO
15. Called a friend on the phone to help him or her feel better	0 1 2 3 4 5 6 7	UO
16. Listened to music to relax	0 1 2 3 4 5 6 7	UO
17. Asked for help with a chore or task	0 1 2 3 4 5 6 7	UO
18. Stretched the muscles in his or her neck (and held the stretch) for at least 10 sec	0 1 2 3 4 5 6 7	UO
19. Didn't let the pain interfere with his or her activities	0 1 2 3 4 5 6 7	UO
20. Exercised to strengthen the muscles in his or her legs for at least 1 min	0 1 2 3 4 5 6 7	UO
21. Listened to a relaxation tape to relax	0 1 2 3 4 5 6 7	UO
22. Engaged in aerobic exercise (exercise that made his or her heart beat faster) for at least 15 minutes	0 1 2 3 4 5 6 7	UO
23. Limited his or her walking because of pain	0 1 2 3 4 5 6 7	UO
24. Just didn't pay attention to the pain	0 1 2 3 4 5 6 7	UO
25. Walked with a limp to decrease the pain	0 1 2 3 4 5 6 7	UO
26. Meditated to relax	0 1 2 3 4 5 6 7	UO
27. Lay on his or her back, stretched, and held the stretch at least 10 sec	0 1 2 3 4 5 6 7	UO
28. Held part of his or her body (e.g., arm) in a special position	0 1 2 3 4 5 6 7	UO
29. Rested in a chair or recliner	0 1 2 3 4 5 6 7	UO
30. Avoided putting weight on feet or legs	0 1 2 3 4 5 6 7	UO
31. Asked for help in carrying, lifting or pushing something	0 1 2 3 4 5 6 7	UO
32. Exercised to improve his or her overall physical condition for at least 5 min	0 1 2 3 4 5 6 7	UO
33. Talked to a friend or family member for support	0 1 2 3 4 5 6 7	UO
34. Limited his or her standing time	0 1 2 3 4 5 6 7	UO
35. Lay down on a bed	0 1 2 3 4 5 6 7	UO
36. Avoided some physical activities (lifting, pushing, carrying)	0 1 2 3 4 5 6 7	UO
37. Used self-hypnosis to relax	0 1 2 3 4 5 6 7	UO
38. Just kept going	0 1 2 3 4 5 6 7	UO
39. Exercised to strengthen the muscles in his or her stomach for at least 1 min	0 1 2 3 4 5 6 7	UO
40. Got together with a friend	0 1 2 3 4 5 6 7	UO
41. Stretched the muscles where he or she hurt and held the stretch for at least 10 sec	0 1 2 3 4 5 6 7	UO
42. Avoided activity	0 1 2 3 4 5 6 7	UO
43. Got together with a family member	0 1 2 3 4 5 6 7	UO
44. Went into a room by him or herself to rest	0 1 2 3 4 5 6 7	UO
45. Used deep, slow breathing to relax	0 1 2 3 4 5 6 7	UO
46. Exercised to strengthen the muscles in his or her back for at least 1 min	0 1 2 3 4 5 6 7	UO
47. Stretched the muscles in his or her shoulders or arms, and held the stretch, for at least 10 sec	0 1 2 3 4 5 6 7	UO
48. Asked someone to get him or her something (e.g., medicine, food, drink)	0 1 2 3 4 5 6 7	UO
49. Did not let the pain affect what he or she was doing	0 1 2 3 4 5 6 7	UO
50. Lay down on a sofa	0 1 2 3 4 5 6 7	UO
51. Ignored the pain	0 1 2 3 4 5 6 7	UO

	Number of days	Unable to observe
52. Please list each medication your significant other took for pain during the past week, and indicate the number of days he or she took each medication during the past week. Some common medications taken for pain are: Aspirin, Tylenol®, Advil®, Nuprin®, Naprosyn®, Percodan®, Tylenol #3®, Valium®, Soma®, Fiorinal®, and Flexeril®. However, there are many others, so please list ALL of the medications that you know your significant other is taking for pain, not just the ones listed above.		
.....	0 1 2 3 4 5 6 7	UO
.....	0 1 2 3 4 5 6 7	UO
.....	0 1 2 3 4 5 6 7	UO
.....	0 1 2 3 4 5 6 7	UO
.....	0 1 2 3 4 5 6 7	UO
.....		

Please place a check mark here if your significant other does not take any medications ☐

Scoring the CPCI

General instructions for both patient and spouse versions: For scales, sum all the items responded to within the scale and divide by the number of items responded to. The scale score will always be between 0 and 7, with a 0 indicating that the respondent reported never using any of the coping strategies within a category during the last week, and a 7 indicating that the respondent reported using each coping strategy in a category every day. For medication use, first categorize the medications as containing opioids, sedative-hypnotics, and non-steroidal anti-inflammatory medications. Any medication containing an opioid or a sedative, count as an opioid and/or sedative, respectively. Any medication containing a non-steroidal anti-inflammatory medication, and *not* containing an opioid or a sedative, categorize as a non-steroidal anti-inflammatory. Sum the number of days each medication category was taken. This number may be greater than 7 if a patient is taking more than one type of opioid and is taking each for more than 4 days each (i.e., Percocet® for 5 days and Darvocet® for 6 days out of the last 7 days equals a score of 11 for Opioid Medication Use).

Patient version scale items

Guarding: (11 + 15 + 33 + 35 + 39 + 41 + 46 + 48 + 56)/9
Resting: (5 + 7 + 18 + 40 + 47 + 58 + 64)/7
Asking for Assistance: (9 + 25 + 42 + 62)/4
Relaxation: (1 + 12 + 24 + 31 + 36 + 50 + 59)/7
Task Persistence: (2 + 4 + 28 + 34 + 51 + 63)/6
Exercise/Stretch: (3 + 13 + 17 + 26 + 29 + 32 + 38 + 43 + 52 + 55 + 60 + 61)/12
Seeking Social Support: (6 + 8 + 16 + 20 + 22 + 44 + 53 + 57)/8
Coping Self-Statements: (10 + 14 + 19 + 21 + 23 + 27 + 30 + 37 + 45 + 49 + 54)/11

Significant-other version scale items

Guarding: (8 + 10 + 23 + 25 + 28 + 30 + 34 + 36 + 42)/9
Resting: (3 + 5 + 13 + 29 + 35 + 44 + 50)/7
Asking for Assistance: (7 + 17 + 31 + 48)/4
Relaxation: (16 + 21 + 26 + 37 + 45)/5
Task Persistence: (1 + 19 + 24 + 38 + 49 + 51)/6
Exercise/Stretch: (2 + 9 + 12 + 18 + 20 + 22 + 27 + 32 + 39 + 41 + 46 + 47)/12
Seeking Social Support: (4 + 6 + 11 + 14 + 15 + 33 + 40 + 43)/8

Appendix 2: Coping measures

(iii) Coping Strategies Questionnaire

CSQ	Item
DA	I try to think of something pleasant.
DA	I count numbers in my head or run a song through my mind.
DA	I play mental games with myself to keep my mind off the pain.
DA	I replay in my mind pleasant experiences in the past.
DA	I think of people I enjoy doing things with.
DA	I think of things I enjoy doing.
IBA	I leave the house and do something, such as going to the movies or shopping.
IBA	I read.
IBA	I try to be around other people.
IBA	I do anything to get my mind off the pain.
IBA	I do something I enjoy, such as watching TV or listening to music.
IBA	I do something active, like household chores or projects.
CSS	I tell myself to be brave and carry on despite the pain.
CSS	I tell myself that I can overcome the pain.
CSS	I tell myself I can't let the pain stand in the way of what I have to do.
CSS	No matter how bad it gets, I know I can handle it.
CSS	I see it as a challenge and don't let it bother me.
CSS	Although it hurts, I just keep on going.
IS	I don't think about the pain.
IS	I tell myself it doesn't hurt.
IS	I don't pay any attention to it.
IS	I pretend it is not there.
IS	I just go on as if nothing happened.
IS	I ignore it.
RS	I try to feel distant from the pain, almost as if the pain was in somebody else's body.
RS	I don't think of it as pain but rather as a dull or warm feeling.
RS	I just think of it as some other sensation, such as numbness.
RS	I try not to think of it as my body, but rather as something separate from me.
RS	I imagine that the pain is outside of my body.
RS	I pretend it is not a part of me.
CAT	It is terrible and I feel it is never going to get any better.
CAT	It is awful and I feel that it overwhelms me.
CAT	I feel my life is not worth living.
CAT	I worry all the time whether it will end.
CAT	I feel I can't stand it any more.
CAT	I feel like I can't go on.
PH	I know some day someone will be here to help me and it will go away for a while.
PH	I pray to God it won't last long.
PH	I try to think years ahead, what everything will be like after I've gotten rid of the pain.
PH	I have faith in doctors that some day there will be a cure for my pain.
PH	I pray for the pain to stop.
PH	I rely on my faith in God.

DA = Diverting Attention; IBA = Increased Behavioral Activities; CCS = Coping Self-Statements; IS = Ignoring Pain; RS = Reinterpreting Pain Sensations; CAT = Catastrophizing; PH = Praying and Hoping; DIS = Distraction; PC = Pain Control.

Appendix 3: Raw data (Chapter 7)

(i) Regression analysis (pain intensity)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.492[a]	.242	.233	2.26005	.242	26.891	5	422	.000
2	.624[b]	.389	.368	2.05053	.147	11.072	9	413	.000

a. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?

b. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?, CSQ - reinterpretation, BL, Active behavioural coping, Passive behavioural coping, HAD anxiety score, BL, TSK, BL, CSQ - diversion, BL, Self efficacy score, BL, CSQ - catastrophising, BL, HAD depression score, BL

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	686.764	5	137.353	26.891	.000[a]
	Residual	2155.494	422	5.108		
	Total	2842.258	427			
2	Regression	1105.735	14	78.981	18.784	.000[b]
	Residual	1736.523	413	4.205		
	Total	2842.258	427			

a. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?

b. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?, CSQ - reinterpretation, BL, Active behavioural coping, Passive behavioural coping, HAD anxiety score, BL, TSK, BL, CSQ - diversion, BL, Self efficacy score, BL, CSQ - catastrophising, BL, HAD depression score, BL

c. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.164	.713		3.033	.003
	Age at recruitment	-.006	.011	-.024	-.550	.583
	Corrected and complete gender	-.327	.224	-.062	-1.457	.146
	Currently employed?	-1.322	.267	-.222	-4.953	.000
	Socio-economic status	.295	.131	.096	2.245	.025
	Duration of current episode	.663	.082	.356	8.089	.000
2	(Constant)	.820	1.131		.725	.469
	Age at recruitment	.000	.010	-.002	-.038	.970
	Corrected and complete gender	-.393	.216	-.075	-1.822	.069
	Currently employed?	-.657	.257	-.110	-2.559	.011
	Socio-economic status	.098	.123	.032	.796	.427
	Duration of current episode	.550	.077	.295	7.189	.000
	CSQ - catastrophising, BL	.050	.018	.153	2.694	.007
	CSQ - diversion, BL	.017	.015	.056	1.129	.260
	CSQ - reinterpretation, BL	.009	.017	.025	.521	.603
	Active behavioural coping	.213	.112	.076	1.910	.057
	Passive behavioural coping	.164	.082	.088	2.004	.046
	TSK, BL	.009	.019	.024	.466	.642
	Self efficacy score, BL	-.019	.010	-.110	-1.889	.060
	HAD anxiety score, BL	-.045	.032	-.079	-1.389	.166
	HAD depression score, BL	.107	.040	.181	2.687	.007

a. Dependent Variable: Pain intensity, 12M

Appendix 3: Raw data (Chapter 7)

(ii) Regression analysis (disability)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.513[a]	.263	.255	5.286	.263	30.686	5	429	.000
2	.681[b]	.464	.449	4.546	.201	22.554	7	422	.000

a. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?

b. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?, Active behavioural coping, Passive behavioural coping, HAD anxiety score, BL, TSK, BL, Self efficacy score, BL, CSQ - catastrophising, BL, HAD depression score, BL

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4286.792	5	857.358	30.686	.000[a]
	Residual	11986.190	429	27.940		
	Total	16272.982	434			
2	Regression	7550.138	12	629.178	30.439	.000[b]
	Residual	8722.845	422	20.670		
	Total	16272.982	434			

a. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?

b. Predictors: (Constant), Duration of current episode, Corrected and complete gender, Age at recruitment, Socio-economic status, Currently employed?, Active behavioural coping, Passive behavioural coping, HAD anxiety score, BL, TSK, BL, Self efficacy score, BL, CSQ - catastrophising, BL, HAD depression score, BL

c. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.510	1.655		2.725	.007
	Age at recruitment	-.006	.025	-.010	-.242	.809
	Corrected and complete gender	-.043	.520	-.003	-.082	.934
	Currently employed?	-3.893	.619	-.275	-6.289	.000
	Socio-economic status	.452	.305	.062	1.482	.139
	Duration of current episode	1.574	.190	.356	8.280	.000
2	(Constant)	2.089	2.476		.844	.399
	Age at recruitment	.011	.022	.018	.496	.620
	Corrected and complete gender	-.556	.471	-.045	-1.179	.239
	Currently employed?	-1.985	.564	-.140	-3.522	.000
	Socio-economic status	-.085	.269	-.012	-.317	.751
	Duration of current episode	1.314	.168	.297	7.823	.000
	CSQ - catastrophising, BL	.063	.040	.082	1.595	.111
	Active behavioural coping	.456	.245	.068	1.861	.063
	Passive behavioural coping	.582	.178	.131	3.264	.001
	TSK, BL	.063	.042	.071	1.518	.130
	Self efficacy score, BL	-.080	.022	-.191	-3.573	.000
	HAD anxiety score, BL	-.141	.071	-.105	-1.983	.048
	HAD depression score, BL	.304	.087	.217	3.510	.000

a. Dependent Variable: Roland and Morris, 12M

Appendix 4: Raw data (Chapter 8)

(i) Chi-square tests (patterns of coping change)

Change in anxiety group, 12m * Change in depression group, 12m Crosstabulation

			Change in depression group, 12m			
			Increase	Decrease	No change	Total
Change in anxiety group, 12m	Increase	Count	19	6	23	48
		% within Change in anxiety group, 12m	39.6%	12.5%	47.9%	100.0%
		% within Change in depression group, 12m	38.0%	4.1%	8.9%	10.5%
		% of Total	4.2%	1.3%	5.1%	10.5%
	Decrease	Count	7	97	78	182
		% within Change in anxiety group, 12m	3.8%	53.3%	42.9%	100.0%
		% within Change in depression group, 12m	14.0%	66.0%	30.2%	40.0%
		% of Total	1.5%	21.3%	17.1%	40.0%
	No change	Count	24	44	157	225
		% within Change in anxiety group, 12m	10.7%	19.6%	69.8%	100.0%
		% within Change in depression group, 12m	48.0%	29.9%	60.9%	49.5%
		% of Total	5.3%	9.7%	34.5%	49.5%
Total		Count	50	147	258	455
		% within Change in anxiety group, 12m	11.0%	32.3%	56.7%	100.0%
		% within Change in depression group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	11.0%	32.3%	56.7%	100.0%

Change in anxiety group, 12m * Change in catastrophizing group, 12m Crosstabulation

			Change in catastrophizing group, 12m			Total
			Increase	Decrease	No change	
Change in anxiety group, 12m	Increase	Count	12	7	22	41
		% within Change in anxiety group, 12m	29.3%	17.1%	53.7%	100.0%
		% within Change in catastrophizing group, 12m	21.4%	5.0%	14.2%	11.6%
		% of Total	3.4%	2.0%	6.3%	11.6%
	Decrease	Count	12	69	55	136
		% within Change in anxiety group, 12m	8.8%	50.7%	40.4%	100.0%
		% within Change in catastrophizing group, 12m	21.4%	48.9%	35.5%	38.6%
		% of Total	3.4%	19.6%	15.6%	38.6%
	No change	Count	32	65	78	175
		% within Change in anxiety group, 12m	18.3%	37.1%	44.6%	100.0%
		% within Change in catastrophizing group, 12m	57.1%	46.1%	50.3%	49.7%
		% of Total	9.1%	18.5%	22.2%	49.7%
Total		Count	56	141	155	352
		% within Change in anxiety group, 12m	15.9%	40.1%	44.0%	100.0%
		% within Change in catastrophizing group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	15.9%	40.1%	44.0%	100.0%

Change in anxiety group, 12m * Change in self efficacy group, 12m Crosstabulation

			Change in self efficacy group, 12m			
			Increase	Decrease	No change	Total
Change in anxiety group, 12m	Increase	Count	5	7	28	40
		% within Change in anxiety group, 12m	12.5%	17.5%	70.0%	100.0%
		% within Change in self efficacy group, 12m	4.9%	14.9%	14.0%	11.4%
		% of Total	1.4%	2.0%	8.0%	11.4%
	Decrease	Count	55	13	69	137
		% within Change in anxiety group, 12m	40.1%	9.5%	50.4%	100.0%
		% within Change in self efficacy group, 12m	53.4%	27.7%	34.5%	39.1%
		% of Total	15.7%	3.7%	19.7%	39.1%
	No change	Count	43	27	103	173
		% within Change in anxiety group, 12m	24.9%	15.6%	59.5%	100.0%
		% within Change in self efficacy group, 12m	41.7%	57.4%	51.5%	49.4%
		% of Total	12.3%	7.7%	29.4%	49.4%
Total		Count	103	47	200	350
		% within Change in anxiety group, 12m	29.4%	13.4%	57.1%	100.0%
		% within Change in self efficacy group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	29.4%	13.4%	57.1%	100.0%

Change in anxiety group, 12m * Change in passive coping group, 12m Crosstabulation

			Change in passive coping group, 12m			
			Increase	Decrease	No change	Total
Change in anxiety group, 12m	Increase	Count	18	22	8	48
		% within Change in anxiety group, 12m	37.5%	45.8%	16.7%	100.0%
		% within Change in passive coping group, 12m	12.2%	12.9%	5.8%	10.5%
		% of Total	3.9%	4.8%	1.8%	10.5%
	Decrease	Count	52	75	56	183
		% within Change in anxiety group, 12m	28.4%	41.0%	30.6%	100.0%
		% within Change in passive coping group, 12m	35.1%	43.9%	40.9%	40.1%
		% of Total	11.4%	16.4%	12.3%	40.1%
	No change	Count	78	74	73	225
		% within Change in anxiety group, 12m	34.7%	32.9%	32.4%	100.0%
		% within Change in passive coping group, 12m	52.7%	43.3%	53.3%	49.3%
		% of Total	17.1%	16.2%	16.0%	49.3%
Total		Count	148	171	137	456
		% within Change in anxiety group, 12m	32.5%	37.5%	30.0%	100.0%
		% within Change in passive coping group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	32.5%	37.5%	30.0%	100.0%

Change in depression group, 12m * Change in anxiety group, 12m Crosstabulation

			Change in anxiety group, 12m			Total
			Increase	Decrease	No change	
Change in depression group, 12m	Increase	Count	19	7	24	50
		% within Change in depression group, 12m	38.0%	14.0%	48.0%	100.0%
		% within Change in anxiety group, 12m	39.6%	3.8%	10.7%	11.0%
		% of Total	4.2%	1.5%	5.3%	11.0%
	Decrease	Count	6	97	44	147
		% within Change in depression group, 12m	4.1%	66.0%	29.9%	100.0%
		% within Change in anxiety group, 12m	12.5%	53.3%	19.6%	32.3%
		% of Total	1.3%	21.3%	9.7%	32.3%
	No change	Count	23	78	157	258
		% within Change in depression group, 12m	8.9%	30.2%	60.9%	100.0%
		% within Change in anxiety group, 12m	47.9%	42.9%	69.8%	56.7%
		% of Total	5.1%	17.1%	34.5%	56.7%
Total		Count	48	182	225	455
		% within Change in depression group, 12m	10.5%	40.0%	49.5%	100.0%
		% within Change in anxiety group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	10.5%	40.0%	49.5%	100.0%

Change in depression group, 12m * Change in catastrophizing group, 12m Crosstabulation

			Change in catastrophizing group, 12m			Total
			Increase	Decrease	No change	
Change in depression group, 12m	Increase	Count	19	10	18	47
		% within Change in depression group, 12m	40.4%	21.3%	38.3%	100.0%
		% within Change in catastrophizing group, 12m	33.9%	7.1%	11.6%	13.4%
		% of Total	5.4%	2.8%	5.1%	13.4%
	Decrease	Count	4	62	40	106
		% within Change in depression group, 12m	3.8%	58.5%	37.7%	100.0%
		% within Change in catastrophizing group, 12m	7.1%	44.3%	25.8%	30.2%
		% of Total	1.1%	17.7%	11.4%	30.2%
	No change	Count	33	68	97	198
		% within Change in depression group, 12m	16.7%	34.3%	49.0%	100.0%
		% within Change in catastrophizing group, 12m	58.9%	48.6%	62.6%	56.4%
		% of Total	9.4%	19.4%	27.6%	56.4%
Total		Count	56	140	155	351
		% within Change in depression group, 12m	16.0%	39.9%	44.2%	100.0%
		% within Change in catastrophizing group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	16.0%	39.9%	44.2%	100.0%

Change in depression group, 12m * Change in self efficacy group, 12m Crosstabulation

			Change in self efficacy group, 12m			Total
			Increase	Decrease	No change	
Change in depression group, 12m	Increase	Count	8	17	22	47
		% within Change in depression group, 12m	17.0%	36.2%	46.8%	100.0%
		% within Change in self efficacy group, 12m	7.8%	36.2%	11.0%	13.4%
		% of Total	2.3%	4.9%	6.3%	13.4%
	Decrease	Count	57	5	47	109
		% within Change in depression group, 12m	52.3%	4.6%	43.1%	100.0%
		% within Change in self efficacy group, 12m	55.3%	10.6%	23.5%	31.1%
		% of Total	16.3%	1.4%	13.4%	31.1%
	No change	Count	38	25	131	194
		% within Change in depression group, 12m	19.6%	12.9%	67.5%	100.0%
		% within Change in self efficacy group, 12m	36.9%	53.2%	65.5%	55.4%
		% of Total	10.9%	7.1%	37.4%	55.4%
Total		Count	103	47	200	350
		% within Change in depression group, 12m	29.4%	13.4%	57.1%	100.0%
		% within Change in self efficacy group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	29.4%	13.4%	57.1%	100.0%

Change in depression group, 12m * Change in passive coping group, 12m Crosstabulation

			Change in passive coping group, 12m			
			Increase	Decrease	No change	Total
Change in depression group, 12m	Increase	Count	27	15	8	50
		% within Change in depression group, 12m	54.0%	30.0%	16.0%	100.0%
		% within Change in passive coping group, 12m	18.4%	8.8%	5.8%	11.0%
		% of Total	5.9%	3.3%	1.8%	11.0%
	Decrease	Count	33	68	46	147
		% within Change in depression group, 12m	22.4%	46.3%	31.3%	100.0%
		% within Change in passive coping group, 12m	22.4%	39.8%	33.6%	32.3%
		% of Total	7.3%	14.9%	10.1%	32.3%
	No change	Count	87	88	83	258
		% within Change in depression group, 12m	33.7%	34.1%	32.2%	100.0%
		% within Change in passive coping group, 12m	59.2%	51.5%	60.6%	56.7%
		% of Total	19.1%	19.3%	18.2%	56.7%
Total		Count	147	171	137	455
		% within Change in depression group, 12m	32.3%	37.6%	30.1%	100.0%
		% within Change in passive coping group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	32.3%	37.6%	30.1%	100.0%

Change in catastrophizing group, 12m * Change in anxiety group, 12m Crosstabulation

			Change in anxiety group, 12m			Total
			Increase	Decrease	No change	
Change in catastrophizing group, 12m	Increase	Count	12	12	32	56
		% within Change in catastrophizing group, 12m	21.4%	21.4%	57.1%	100.0%
		% within Change in anxiety group, 12m	29.3%	8.8%	18.3%	15.9%
		% of Total	3.4%	3.4%	9.1%	15.9%
	Decrease	Count	7	69	65	141
		% within Change in catastrophizing group, 12m	5.0%	48.9%	46.1%	100.0%
		% within Change in anxiety group, 12m	17.1%	50.7%	37.1%	40.1%
		% of Total	2.0%	19.6%	18.5%	40.1%
	No change	Count	22	55	78	155
		% within Change in catastrophizing group, 12m	14.2%	35.5%	50.3%	100.0%
		% within Change in anxiety group, 12m	53.7%	40.4%	44.6%	44.0%
		% of Total	6.3%	15.6%	22.2%	44.0%
Total		Count	41	136	175	352
		% within Change in catastrophizing group, 12m	11.6%	38.6%	49.7%	100.0%
		% within Change in anxiety group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	11.6%	38.6%	49.7%	100.0%

Change in catastrophizing group, 12m * Change in depression group, 12m Crosstabulation

			Change in depression group, 12m			
			Increase	Decrease	No change	Total
Change in catastrophizing group, 12m	Increase	Count	19	4	33	56
		% within Change in catastrophizing group, 12m	33.9%	7.1%	58.9%	100.0%
		% within Change in depression group, 12m	40.4%	3.8%	16.7%	16.0%
		% of Total	5.4%	1.1%	9.4%	16.0%
	Decrease	Count	10	62	68	140
		% within Change in catastrophizing group, 12m	7.1%	44.3%	48.6%	100.0%
		% within Change in depression group, 12m	21.3%	58.5%	34.3%	39.9%
		% of Total	2.8%	17.7%	19.4%	39.9%
	No change	Count	18	40	97	155
		% within Change in catastrophizing group, 12m	11.6%	25.8%	62.6%	100.0%
		% within Change in depression group, 12m	38.3%	37.7%	49.0%	44.2%
		% of Total	5.1%	11.4%	27.6%	44.2%
Total		Count	47	106	198	351
		% within Change in catastrophizing group, 12m	13.4%	30.2%	56.4%	100.0%
		% within Change in depression group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	13.4%	30.2%	56.4%	100.0%

Change in catastrophizing group, 12m * Change in self efficacy group, 12m Crosstabulation

			Change in self efficacy group, 12m			Total
			Increase	Decrease	No change	
Change in catastrophizing group, 12m	Increase	Count	6	21	29	56
		% within Change in catastrophizing group, 12m	10.7%	37.5%	51.8%	100.0%
		% within Change in self efficacy group, 12m	5.9%	45.7%	14.5%	16.1%
		% of Total	1.7%	6.0%	8.3%	16.1%
	Decrease	Count	63	5	71	139
		% within Change in catastrophizing group, 12m	45.3%	3.6%	51.1%	100.0%
		% within Change in self efficacy group, 12m	61.8%	10.9%	35.5%	39.9%
		% of Total	18.1%	1.4%	20.4%	39.9%
	No change	Count	33	20	100	153
		% within Change in catastrophizing group, 12m	21.6%	13.1%	65.4%	100.0%
		% within Change in self efficacy group, 12m	32.4%	43.5%	50.0%	44.0%
		% of Total	9.5%	5.7%	28.7%	44.0%
Total		Count	102	46	200	348
		% within Change in catastrophizing group, 12m	29.3%	13.2%	57.5%	100.0%
		% within Change in self efficacy group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	29.3%	13.2%	57.5%	100.0%

Change in catastrophizing group, 12m * Change in passive coping group, 12m Crosstabulation

			Change in passive coping group, 12m			Total
			Increase	Decrease	No change	
Change in catastrophizing group, 12m	Increase	Count	31	11	15	57
		% within Change in catastrophizing group, 12m	54.4%	19.3%	26.3%	100.0%
		% within Change in passive coping group, 12m	23.5%	9.6%	13.9%	16.1%
		% of Total	8.8%	3.1%	4.2%	16.1%
	Decrease	Count	46	57	39	142
		% within Change in catastrophizing group, 12m	32.4%	40.1%	27.5%	100.0%
		% within Change in passive coping group, 12m	34.8%	50.0%	36.1%	40.1%
		% of Total	13.0%	16.1%	11.0%	40.1%
	No change	Count	55	46	54	155
		% within Change in catastrophizing group, 12m	35.5%	29.7%	34.8%	100.0%
		% within Change in passive coping group, 12m	41.7%	40.4%	50.0%	43.8%
		% of Total	15.5%	13.0%	15.3%	43.8%
Total		Count	132	114	108	354
		% within Change in catastrophizing group, 12m	37.3%	32.2%	30.5%	100.0%
		% within Change in passive coping group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	37.3%	32.2%	30.5%	100.0%

Change in self efficacy group, 12m * Change in anxiety group, 12m Crosstabulation

			Change in anxiety group, 12m			Total
			Increase	Decrease	No change	
Change in self efficacy group, 12m	Increase	Count	5	55	43	103
		% within Change in self efficacy group, 12m	4.9%	53.4%	41.7%	100.0%
		% within Change in anxiety group, 12m	12.5%	40.1%	24.9%	29.4%
		% of Total	1.4%	15.7%	12.3%	29.4%
	Decrease	Count	7	13	27	47
		% within Change in self efficacy group, 12m	14.9%	27.7%	57.4%	100.0%
		% within Change in anxiety group, 12m	17.5%	9.5%	15.6%	13.4%
		% of Total	2.0%	3.7%	7.7%	13.4%
	No change	Count	28	69	103	200
		% within Change in self efficacy group, 12m	14.0%	34.5%	51.5%	100.0%
		% within Change in anxiety group, 12m	70.0%	50.4%	59.5%	57.1%
		% of Total	8.0%	19.7%	29.4%	57.1%
Total		Count	40	137	173	350
		% within Change in self efficacy group, 12m	11.4%	39.1%	49.4%	100.0%
		% within Change in anxiety group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	11.4%	39.1%	49.4%	100.0%

Change in self efficacy group, 12m * Change in depression group, 12m Crosstabulation

			Change in depression group, 12m			Total
			Increase	Decrease	No change	
Change in self efficacy group, 12m	Increase	Count	8	57	38	103
		% within Change in self efficacy group, 12m	7.8%	55.3%	36.9%	100.0%
		% within Change in depression group, 12m	17.0%	52.3%	19.6%	29.4%
		% of Total	2.3%	16.3%	10.9%	29.4%
	Decrease	Count	17	5	25	47
		% within Change in self efficacy group, 12m	36.2%	10.6%	53.2%	100.0%
		% within Change in depression group, 12m	36.2%	4.6%	12.9%	13.4%
		% of Total	4.9%	1.4%	7.1%	13.4%
	No change	Count	22	47	131	200
		% within Change in self efficacy group, 12m	11.0%	23.5%	65.5%	100.0%
		% within Change in depression group, 12m	46.8%	43.1%	67.5%	57.1%
		% of Total	6.3%	13.4%	37.4%	57.1%
Total		Count	47	109	194	350
		% within Change in self efficacy group, 12m	13.4%	31.1%	55.4%	100.0%
		% within Change in depression group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	13.4%	31.1%	55.4%	100.0%

Change in self efficacy group, 12m * Change in catastrophizing group, 12m Crosstabulation

			Change in catastrophizing group, 12m			Total
			Increase	Decrease	No change	
Change in self efficacy group, 12m	Increase	Count	6	63	33	102
		% within Change in self efficacy group, 12m	5.9%	61.8%	32.4%	100.0%
		% within Change in catastrophizing group, 12m	10.7%	45.3%	21.6%	29.3%
		% of Total	1.7%	18.1%	9.5%	29.3%
	Decrease	Count	21	5	20	46
		% within Change in self efficacy group, 12m	45.7%	10.9%	43.5%	100.0%
		% within Change in catastrophizing group, 12m	37.5%	3.6%	13.1%	13.2%
		% of Total	6.0%	1.4%	5.7%	13.2%
	No change	Count	29	71	100	200
		% within Change in self efficacy group, 12m	14.5%	35.5%	50.0%	100.0%
		% within Change in catastrophizing group, 12m	51.8%	51.1%	65.4%	57.5%
		% of Total	8.3%	20.4%	28.7%	57.5%
Total		Count	56	139	153	348
		% within Change in self efficacy group, 12m	16.1%	39.9%	44.0%	100.0%
		% within Change in catastrophizing group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	16.1%	39.9%	44.0%	100.0%

Change in self efficacy group, 12m * Change in passive coping group, 12m Crosstabulation

			Change in passive coping group, 12m			
			Increase	Decrease	No change	Total
Change in self efficacy group, 12m	Increase	Count	27	44	32	103
		% within Change in self efficacy group, 12m	26.2%	42.7%	31.1%	100.0%
		% within Change in passive coping group, 12m	20.8%	38.9%	29.4%	29.3%
		% of Total	7.7%	12.5%	9.1%	29.3%
	Decrease	Count	24	9	14	47
		% within Change in self efficacy group, 12m	51.1%	19.1%	29.8%	100.0%
		% within Change in passive coping group, 12m	18.5%	8.0%	12.8%	13.4%
		% of Total	6.8%	2.6%	4.0%	13.4%
	No change	Count	79	60	63	202
		% within Change in self efficacy group, 12m	39.1%	29.7%	31.2%	100.0%
		% within Change in passive coping group, 12m	60.8%	53.1%	57.8%	57.4%
		% of Total	22.4%	17.0%	17.9%	57.4%
Total		Count	130	113	109	352
		% within Change in self efficacy group, 12m	36.9%	32.1%	31.0%	100.0%
		% within Change in passive coping group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	36.9%	32.1%	31.0%	100.0%

Change in passive coping group, 12m * Change in anxiety group, 12m Crosstabulation

			Change in anxiety group, 12m			Total
			Increase	Decrease	No change	
Change in passive coping group, 12m	Increase	Count	18	52	78	148
		% within Change in passive coping group, 12m	12.2%	35.1%	52.7%	100.0%
		% within Change in anxiety group, 12m	37.5%	28.4%	34.7%	32.5%
		% of Total	3.9%	11.4%	17.1%	32.5%
	Decrease	Count	22	75	74	171
		% within Change in passive coping group, 12m	12.9%	43.9%	43.3%	100.0%
		% within Change in anxiety group, 12m	45.8%	41.0%	32.9%	37.5%
		% of Total	4.8%	16.4%	16.2%	37.5%
	No change	Count	8	56	73	137
		% within Change in passive coping group, 12m	5.8%	40.9%	53.3%	100.0%
		% within Change in anxiety group, 12m	16.7%	30.6%	32.4%	30.0%
		% of Total	1.8%	12.3%	16.0%	30.0%
Total		Count	48	183	225	456
		% within Change in passive coping group, 12m	10.5%	40.1%	49.3%	100.0%
		% within Change in anxiety group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	10.5%	40.1%	49.3%	100.0%

Change in passive coping group, 12m * Change in depression group, 12m Crosstabulation

			Change in depression group, 12m			
			Increase	Decrease	No change	Total
Change in passive coping group, 12m	Increase	Count	27	33	87	147
		% within Change in passive coping group, 12m	18.4%	22.4%	59.2%	100.0%
		% within Change in depression group, 12m	54.0%	22.4%	33.7%	32.3%
		% of Total	5.9%	7.3%	19.1%	32.3%
	Decrease	Count	15	68	88	171
		% within Change in passive coping group, 12m	8.8%	39.8%	51.5%	100.0%
		% within Change in depression group, 12m	30.0%	46.3%	34.1%	37.6%
		% of Total	3.3%	14.9%	19.3%	37.6%
	No change	Count	8	46	83	137
		% within Change in passive coping group, 12m	5.8%	33.6%	60.6%	100.0%
		% within Change in depression group, 12m	16.0%	31.3%	32.2%	30.1%
		% of Total	1.8%	10.1%	18.2%	30.1%
Total		Count	50	147	258	455
		% within Change in passive coping group, 12m	11.0%	32.3%	56.7%	100.0%
		% within Change in depression group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	11.0%	32.3%	56.7%	100.0%

Change in passive coping group, 12m * Change in catastrophizing group, 12m Crosstabulation

			Change in catastrophizing group, 12m			
			Increase	Decrease	No change	Total
Change in passive coping group, 12m	Increase	Count	31	46	55	132
		% within Change in passive coping group, 12m	23.5%	34.8%	41.7%	100.0%
		% within Change in catastrophizing group, 12m	54.4%	32.4%	35.5%	37.3%
		% of Total	8.8%	13.0%	15.5%	37.3%
	Decrease	Count	11	57	46	114
		% within Change in passive coping group, 12m	9.6%	50.0%	40.4%	100.0%
		% within Change in catastrophizing group, 12m	19.3%	40.1%	29.7%	32.2%
		% of Total	3.1%	16.1%	13.0%	32.2%
	No change	Count	15	39	54	108
		% within Change in passive coping group, 12m	13.9%	36.1%	50.0%	100.0%
		% within Change in catastrophizing group, 12m	26.3%	27.5%	34.8%	30.5%
		% of Total	4.2%	11.0%	15.3%	30.5%
Total		Count	57	142	155	354
		% within Change in passive coping group, 12m	16.1%	40.1%	43.8%	100.0%
		% within Change in catastrophizing group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	16.1%	40.1%	43.8%	100.0%

Change in passive coping group, 12m * Change in self efficacy group, 12m Crosstabulation

			Change in self efficacy group, 12m			
			Increase	Decrease	No change	Total
Change in passive coping group, 12m	Increase	Count	27	24	79	130
		% within Change in passive coping group, 12m	20.8%	18.5%	60.8%	100.0%
		% within Change in self efficacy group, 12m	26.2%	51.1%	39.1%	36.9%
		% of Total	7.7%	6.8%	22.4%	36.9%
	Decrease	Count	44	9	60	113
		% within Change in passive coping group, 12m	38.9%	8.0%	53.1%	100.0%
		% within Change in self efficacy group, 12m	42.7%	19.1%	29.7%	32.1%
		% of Total	12.5%	2.6%	17.0%	32.1%
	No change	Count	32	14	63	109
		% within Change in passive coping group, 12m	29.4%	12.8%	57.8%	100.0%
		% within Change in self efficacy group, 12m	31.1%	29.8%	31.2%	31.0%
		% of Total	9.1%	4.0%	17.9%	31.0%
Total		Count	103	47	202	352
		% within Change in passive coping group, 12m	29.3%	13.4%	57.4%	100.0%
		% within Change in self efficacy group, 12m	100.0%	100.0%	100.0%	100.0%
		% of Total	29.3%	13.4%	57.4%	100.0%

Appendix 4: Raw data (Chapter 8)

(ii) Numbers and percentages of patients within each pain duration group dichotomised by coping worsening or improvement

	Worsening				
	Less than 1 month	**1 – 3 months**	**4 – 6 months**	**7 months – 3 years**	**More than 3 years**
Anxiety	18 (9.4%)	13 (11.2%)	7 (15.6%)	3 (6.3%)	7 (16.7%)
Depression	14 (7.3%)	14 (12.1%)	7 (15.6%)	4 (8.5%)	11 (26.2%)
Catastrophizing	16 (12.3%)	15 (16.3%)	6 (15%)	13 (28.9%)	5 (13.2%)
Self-efficacy	15 (11.5%)	13 (14.1%)	5 (12.8%)	5 (11.9%)	9 (23.7%)
Passive behavioural coping	54 (28%)	28 (23.9%)	18 (40%)	26 (53.1%)	19 (45.2%)

	Improvement				
	Less than 1 month	**1 – 3 months**	**4 – 6 months**	**7 months – 3 years**	**More than 3 years**
Anxiety	85 (44.3%)	52 (44.8%)	17 (37.8%)	15 (31.3%)	9 (21.4%)
Depression	68 (35.4%)	46 (39.7%)	11 (24.4%)	10 (21.3%)	9 (21.4%)
Catastrophizing	55 (42.3%)	38 (41.3%)	22 (55%)	14 (31.1%)	11 (28.9%)
Self-efficacy	46 (35.1%)	32 (34.8%)	11 (28.2%)	4 (9.5%)	8 (21.1%)
Passive behavioural coping	94 (48.7%)	45 (38.5%)	14 (31.1%)	10 (20.4%)	8 (19%)

Appendix 4: Raw data (Chapter 8)

(iii) One way ANOVAs (differences between coping change groups)

ANOVA

Pain intensity, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	103.674	2	51.837	8.069	.000
Within Groups	2871.668	447	6.424		
Total	2975.342	449			

Multiple Comparisons

Pain intensity, 12M
Tukey HSD

(I) Change in anxiety group, 12m	(J) Change in anxiety group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	1.66396*	.41495	.000	.6882	2.6397
	No change	1.26382*	.40697	.006	.3068	2.2208
Decrease	Increase	-1.66396*	.41495	.000	-2.6397	-.6882
	No change	-.40015	.25383	.257	-.9970	.1968
No change	Increase	-1.26382*	.40697	.006	-2.2208	-.3068
	Decrease	.40015	.25383	.257	-.1968	.9970

*. The mean difference is significant at the 0.05 level.

ANOVA

Roland and Morris, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	828.689	2	414.345	11.657	.000
Within Groups	16101.092	453	35.543		
Total	16929.781	455			

Multiple Comparisons

Roland and Morris, 12M
Tukey HSD

(I) Change in anxiety group, 12m	(J) Change in anxiety group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	4.644*	.967	.000	2.37	6.92
	No change	3.403*	.948	.001	1.17	5.63
Decrease	Increase	-4.644*	.967	.000	-6.92	-2.37
	No change	-1.241	.593	.093	-2.64	.15
No change	Increase	-3.403*	.948	.001	-5.63	-1.17
	Decrease	1.241	.593	.093	-.15	2.64

*. The mean difference is significant at the 0.05 level.

ANOVA

Pain intensity, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	133.414	2	66.707	10.492	.000
Within Groups	2841.928	447	6.358		
Total	2975.342	449			

Multiple Comparisons

Pain intensity, 12M
Tukey HSD

(I) Change in depression group, 12m	(J) Change in depression group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	1.90476*	.41593	.000	.9267	2.8828
	No change	1.40157*	.39342	.001	.4764	2.3267
Decrease	Increase	-1.90476*	.41593	.000	-2.8828	-.9267
	No change	-.50319	.26131	.133	-1.1177	.1113
No change	Increase	-1.40157*	.39342	.001	-2.3267	-.4764
	Decrease	.50319	.26131	.133	-.1113	1.1177

*. The mean difference is significant at the 0.05 level.

ANOVA

Roland and Morris, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1143.723	2	571.862	16.402	.000
Within Groups	15759.077	452	34.865		
Total	16902.800	454			

Multiple Comparisons

Roland and Morris, 12M
Tukey HSD

(I) Change in depression group, 12m	(J) Change in depression group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	5.527*	.967	.000	3.25	7.80
	No change	3.940*	.912	.000	1.79	6.09
Decrease	Increase	-5.527*	.967	.000	-7.80	-3.25
	No change	-1.587*	.610	.026	-3.02	-.15
No change	Increase	-3.940*	.912	.000	-6.09	-1.79
	Decrease	1.587*	.610	.026	.15	3.02

*. The mean difference is significant at the 0.05 level.

ANOVA

Pain intensity, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	115.340	2	57.670	9.204	.000
Within Groups	2174.115	347	6.265		
Total	2289.455	349			

Multiple Comparisons

Pain intensity, 12M
Tukey HSD

(I) Change in catastrophizing group, 12m	(J) Change in catastrophizing group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	1.65595*	.39577	.000	.7244	2.5875
	No change	1.43885*	.39060	.001	.5195	2.3583
Decrease	Increase	-1.65595*	.39577	.000	-2.5875	-.7244
	No change	-.21710	.29230	.738	-.9051	.4709
No change	Increase	-1.43885*	.39060	.001	-2.3583	-.5195
	Decrease	.21710	.29230	.738	-.4709	.9051

*. The mean difference is significant at the 0.05 level.

ANOVA

Roland and Morris, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	984.803	2	492.402	14.076	.000
Within Groups	12278.194	351	34.981		
Total	13262.997	353			

Multiple Comparisons

Roland and Morris, 12M
Tukey HSD

(I) Change in catastrophizing group, 12m	(J) Change in catastrophizing group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	4.814*	.927	.000	2.63	7.00
	No change	4.130*	.916	.000	1.97	6.29
Decrease	Increase	-4.814*	.927	.000	-7.00	-2.63
	No change	-.684	.687	.580	-2.30	.93
No change	Increase	-4.130*	.916	.000	-6.29	-1.97
	Decrease	.684	.687	.580	-.93	2.30

*. The mean difference is significant at the 0.05 level.

ANOVA

Pain intensity, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	117.700	2	58.850	9.555	.000
Within Groups	2131.054	346	6.159		
Total	2248.754	348			

Multiple Comparisons

Pain intensity, 12M
Tukey HSD

(I) Change in self efficacy group, 12m	(J) Change in self efficacy group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	-1.76903*	.44010	.000	-2.8050	-.7331
	No change	-1.00765*	.30099	.003	-1.7161	-.2992
Decrease	Increase	1.76903*	.44010	.000	.7331	2.8050
	No change	.76138	.40582	.147	-.1939	1.7166
No change	Increase	1.00765*	.30099	.003	.2992	1.7161
	Decrease	-.76138	.40582	.147	-1.7166	.1939

*. The mean difference is significant at the 0.05 level.

ANOVA

Roland and Morris, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	850.556	2	425.278	12.140	.000
Within Groups	12225.808	349	35.031		
Total	13076.364	351			

Multiple Comparisons

Roland and Morris, 12M
Tukey HSD

(I) Change in self efficacy group, 12m	(J) Change in self efficacy group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	-5.019*	1.042	.000	-7.47	-2.57
	No change	-2.232*	.717	.006	-3.92	-.55
Decrease	Increase	5.019*	1.042	.000	2.57	7.47
	No change	2.787*	.959	.011	.53	5.04
No change	Increase	2.232*	.717	.006	.55	3.92
	Decrease	-2.787*	.959	.011	-5.04	-.53

*. The mean difference is significant at the 0.05 level.

ANOVA

Pain intensity, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	274.555	2	137.278	22.703	.000
Within Groups	2714.957	449	6.047		
Total	2989.512	451			

Multiple Comparisons

Pain intensity, 12M
Tukey HSD

(I) Change in passive coping group, 12m	(J) Change in passive coping group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	1.83100*	.27709	.000	1.1794	2.4826
	No change	.65439	.29361	.067	-.0360	1.3448
Decrease	Increase	-1.83100*	.27709	.000	-2.4826	-1.1794
	No change	-1.17661*	.28311	.000	-1.8423	-.5109
No change	Increase	-.65439	.29361	.067	-1.3448	.0360
	Decrease	1.17661*	.28311	.000	.5109	1.8423

*. The mean difference is significant at the 0.05 level.

ANOVA

Roland and Morris, 12M

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1513.651	2	756.826	22.275	.000
Within Groups	15492.976	456	33.976		
Total	17006.627	458			

Multiple Comparisons

Roland and Morris, 12M
Tukey HSD

(I) Change in passive coping group, 12m	(J) Change in passive coping group, 12m	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Increase	Decrease	4.334*	.653	.000	2.80	5.87
	No change	1.940*	.690	.014	.32	3.56
Decrease	Increase	-4.334*	.653	.000	-5.87	-2.80
	No change	-2.395*	.665	.001	-3.96	-.83
No change	Increase	-1.940*	.690	.014	-3.56	-.32
	Decrease	2.395*	.665	.001	.83	3.96

*. The mean difference is significant at the 0.05 level.

Appendix 4: Raw data (Chapter 8)

(iv) Regression analysis for coping improvement (pain intensity and disability)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.477[a]	.227	.222	2.27494	.227	49.791	2	339	.000
2	.525[b]	.276	.261	2.21827	.049	4.508	5	334	.001

a. Predictors: (Constant), Duration of current episode, Currently employed?

b. Predictors: (Constant), Duration of current episode, Currently employed?, Catastrophizing decrease code, Anxiety decrease code, Passive decrease code, Self efficacy increase code, Depression decrease code

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	515.374	2	257.687	49.791	.000[a]
	Residual	1754.439	339	5.175		
	Total	2269.812	341			
2	Regression	626.285	7	89.469	18.182	.000[b]
	Residual	1643.528	334	4.921		
	Total	2269.812	341			

a. Predictors: (Constant), Duration of current episode, Currently employed?

b. Predictors: (Constant), Duration of current episode, Currently employed?, Catastrophizing decrease code, Anxiety decrease code, Passive decrease code, Self efficacy increase code, Depression decrease code

c. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.101	.366		5.747	.000
	Currently employed?	-1.398	.295	-.235	-4.744	.000
	Duration of current episode	.668	.092	.358	7.250	.000
2	(Constant)	2.905	.405		7.180	.000
	Currently employed?	-1.318	.289	-.221	-4.564	.000
	Duration of current episode	.559	.093	.300	6.016	.000
	Anxiety decrease code	-.108	.266	-.021	-.406	.685
	Depression decrease code	-.056	.292	-.010	-.193	.847
	Catastrophizing decrease code	-.048	.262	-.009	-.184	.854
	Self efficacy increase code	-.594	.290	-.105	-2.046	.042
	Passive decrease code	-.952	.257	-.179	-3.698	.000

a. Dependent Variable: Pain intensity, 12M

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.509[a]	.259	.255	5.285	.259	59.384	2	339	.000
2	.552[b]	.305	.291	5.158	.046	4.390	5	334	.001

a. Predictors: (Constant), Duration of current episode, Currently employed?

b. Predictors: (Constant), Duration of current episode, Currently employed?, Catastrophizing decrease code, Anxiety decrease code, Passive decrease code, Self efficacy increase code, Depression decrease code

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3317.299	2	1658.649	59.384	.000[a]
	Residual	9468.616	339	27.931		
	Total	12785.915	341			
2	Regression	3901.200	7	557.314	20.951	.000[b]
	Residual	8884.715	334	26.601		
	Total	12785.915	341			

a. Predictors: (Constant), Duration of current episode, Currently employed?

b. Predictors: (Constant), Duration of current episode, Currently employed?, Catastrophizing decrease code, Anxiety decrease code, Passive decrease code, Self efficacy increase code, Depression decrease code

c. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.151	.849		6.065	.000
	Currently employed?	-3.968	.685	-.280	-5.795	.000
	Duration of current episode	1.587	.214	.359	7.413	.000
2	(Constant)	7.136	.941		7.587	.000
	Currently employed?	-3.737	.671	-.264	-5.566	.000
	Duration of current episode	1.337	.216	.302	6.184	.000
	Anxiety decrease code	-.441	.618	-.035	-.713	.476
	Depression decrease code	-.564	.679	-.043	-.830	.407
	Catastrophizing decrease code	-.403	.608	-.032	-.662	.508
	Self efficacy increase code	-1.122	.675	-.083	-1.662	.097
	Passive decrease code	-1.945	.599	-.154	-3.250	.001

a. Dependent Variable: Roland and Morris, 12M

Appendix 4: Raw data (Chapter 8)

(v) Regression analysis for depression and passive coping worsening (pain intensity and disability)

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.419[a]	.176	.174	2.34500	.176	93.811	1	440	.000
2	.441[b]	.194	.191	2.32126	.018	10.047	1	439	.002

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Depression increase code

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	515.869	1	515.869	93.811	.000[a]
	Residual	2419.577	440	5.499		
	Total	2935.447	441			
2	Regression	570.006	2	285.003	52.893	.000[b]
	Residual	2365.441	439	5.388		
	Total	2935.447	441			

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Depression increase code

c. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.790	.217		3.641	.000
	Duration of current episode	.781	.081	.419	9.686	.000
2	(Constant)	.747	.215		3.470	.001
	Duration of current episode	.746	.081	.400	9.256	.000
	Depression increase code	1.130	.356	.137	3.170	.002

a. Dependent Variable: Pain intensity, 12M

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.419[a]	.176	.174	2.34498	.176	94.664	1	444	.000
2	.452[b]	.204	.201	2.30675	.028	15.839	1	443	.000

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Passive increase code

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	520.548	1	520.548	94.664	.000[a]
	Residual	2441.524	444	5.499		
	Total	2962.072	445			
2	Regression	604.831	2	302.415	56.833	.000[b]
	Residual	2357.241	443	5.321		
	Total	2962.072	445			

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Passive increase code

c. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.790	.216		3.658	.000
	Duration of current episode	.781	.080	.419	9.730	.000
2	(Constant)	.613	.217		2.822	.005
	Duration of current episode	.726	.080	.390	9.055	.000
	Passive increase code	.944	.237	.171	3.980	.000

a. Dependent Variable: Pain intensity, 12M

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.431[a]	.186	.184	5.531	.186	100.604	1	440	.000
2	.465[b]	.216	.213	5.433	.030	16.982	1	439	.000

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Depression increase code

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3077.165	1	3077.165	100.604	.000[a]
	Residual	13458.284	440	30.587		
	Total	16535.450	441			
2	Regression	3578.379	2	1789.189	60.620	.000[b]
	Residual	12957.071	439	29.515		
	Total	16535.450	441			

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Depression increase code

c. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.431	.512		2.797	.005
	Duration of current episode	1.908	.190	.431	10.030	.000
2	(Constant)	1.300	.504		2.581	.010
	Duration of current episode	1.802	.189	.407	9.547	.000
	Depression increase code	3.438	.834	.176	4.121	.000

a. Dependent Variable: Roland and Morris, 12M

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.431[a]	.186	.184	5.530	.186	101.518	1	444	.000
2	.467[b]	.218	.215	5.426	.032	18.245	1	443	.000

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Passive increase code

ANOVA[c]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3105.076	1	3105.076	101.518	.000[a]
	Residual	13580.355	444	30.586		
	Total	16685.431	445			
2	Regression	3642.250	2	1821.125	61.853	.000[b]
	Residual	13043.181	443	29.443		
	Total	16685.431	445			

a. Predictors: (Constant), Duration of current episode

b. Predictors: (Constant), Duration of current episode, Passive increase code

c. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.431	.509		2.809	.005
	Duration of current episode	1.908	.189	.431	10.076	.000
2	(Constant)	.983	.511		1.926	.055
	Duration of current episode	1.769	.189	.400	9.377	.000
	Passive increase code	2.384	.558	.182	4.271	.000

a. Dependent Variable: Roland and Morris, 12M

Appendix 4: Raw data (Chapter 8)

(vi) Regression analysis for employment status section

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	10.308	.223		46.159	.000
	Currently employed?	-2.722	.258	-.259	-10.561	.000

a. Dependent Variable: HAD anxiety score, BL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	8.716	.212		41.050	.000
	Currently employed?	-2.915	.245	-.289	-11.894	.000

a. Dependent Variable: HAD depression score, BL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	13.572	.393		34.506	.000
	Currently employed?	-4.814	.454	-.261	-10.603	.000

a. Dependent Variable: CSQ - catastrophising, BL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	29.380	.699		42.030	.000
	Currently employed?	11.233	.807	.334	13.922	.000

a. Dependent Variable: Self efficacy score, BL

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.552	.069		37.017	.000
	Currently employed?	-.545	.080	-.171	-6.846	.000

a. Dependent Variable: Passive behavioural coping

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.133	.029		4.585	.000
	Currently employed?	-.037	.034	-.052	-1.109	.268

a. Dependent Variable: Anxiety increase code

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.142	.030		4.790	.000
	Currently employed?	-.043	.034	-.059	-1.246	.213

a. Dependent Variable: Depression increase code

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.212	.039		5.372	.000
	Currently employed?	-.068	.046	-.080	-1.492	.137

a. Dependent Variable: Catastrophizing increase code

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.191	.037		5.212	.000
	Currently employed?	-.076	.042	-.097	-1.803	.072

a. Dependent Variable: Self efficacy decrease code

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.371	.044		8.427	.000
	Currently employed?	-.065	.051	-.060	-1.282	.201

a. Dependent Variable: Passive increase code

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.058	.228		17.777	.000
	Currently employed?	-1.952	.263	-.327	-7.408	.000
2	(Constant)	2.620	.340		7.694	.000
	Currently employed?	-1.572	.264	-.264	-5.949	.000
	HAD anxiety score, BL	.139	.025	.246	5.554	.000

a. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.058	.228		17.777	.000
	Currently employed?	-1.952	.263	-.327	-7.408	.000
2	(Constant)	2.215	.307		7.207	.000
	Currently employed?	-1.336	.257	-.224	-5.203	.000
	HAD depression score, BL	.211	.025	.358	8.309	.000

a. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.058	.228		17.777	.000
	Currently employed?	-1.952	.263	-.327	-7.408	.000
2	(Constant)	2.347	.280		8.397	.000
	Currently employed?	-1.345	.251	-.226	-5.365	.000
	CSQ - catastrophising, BL	.126	.014	.389	9.252	.000

a. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.058	.228		17.777	.000
	Currently employed?	-1.952	.263	-.327	-7.408	.000
2	(Constant)	5.937	.312		19.025	.000
	Currently employed?	-1.234	.261	-.207	-4.726	.000
	Self efficacy score, BL	-.064	.008	-.361	-8.246	.000

a. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.058	.228		17.777	.000
	Currently employed?	-1.952	.263	-.327	-7.408	.000
2	(Constant)	2.982	.304		9.803	.000
	Currently employed?	-1.722	.260	-.289	-6.620	.000
	Passive behavioural coping	.422	.081	.226	5.178	.000

a. Dependent Variable: Pain intensity, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.799	.528		18.564	.000
	Currently employed?	-5.283	.609	-.373	-8.670	.000
2	(Constant)	6.332	.786		8.061	.000
	Currently employed?	-4.368	.610	-.309	-7.164	.000
	HAD anxiety score, BL	.336	.058	.250	5.804	.000

a. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.799	.528		18.564	.000
	Currently employed?	-5.283	.609	-.373	-8.670	.000
2	(Constant)	4.767	.690		6.904	.000
	Currently employed?	-3.600	.577	-.254	-6.243	.000
	HAD depression score, BL	.577	.057	.412	10.103	.000

a. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.799	.528		18.564	.000
	Currently employed?	-5.283	.609	-.373	-8.670	.000
2	(Constant)	5.838	.647		9.021	.000
	Currently employed?	-3.878	.581	-.274	-6.680	.000
	CSQ - catastrophising, BL	.292	.032	.380	9.253	.000

a. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.799	.528		18.564	.000
	Currently employed?	-5.283	.609	-.373	-8.670	.000
2	(Constant)	15.362	.688		22.337	.000
	Currently employed?	-3.156	.575	-.223	-5.485	.000
	Self efficacy score, BL	-.189	.017	-.450	-11.077	.000

a. Dependent Variable: Roland and Morris, 12M

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.799	.528		18.564	.000
	Currently employed?	-5.283	.609	-.373	-8.670	.000
2	(Constant)	6.637	.691		9.605	.000
	Currently employed?	-4.608	.591	-.326	-7.796	.000
	Passive behavioural coping	1.239	.185	.280	6.695	.000

a. Dependent Variable: Roland and Morris, 12M